ENGINEERING AND MINING JOURNAL

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빛나는 새해를 축하합니다

Yeni Seneniz Kutlu Olsun

Εὐτυχές τό Νέον "Ετος

Joyeux Noël, Bonne Année

Selamat hari Krismés dan Tahun Baru

Веселого Рождества и Счастливого Нового Года ✶ Frohe Weihnachten und Gutes Neues Jahr ✶ 'n Geseënde Kersfees 'n Gelukkige Nuwejaar ✶ मालू मुबारक

Wesołych Świąt I Szczęśliwego Nowego Roku ✶ Gezellige Kerstmis en een Gelukkig Nieuw Jaar ✶ Felices Pascuas y Próspero Año Nuevo

Feliz Natal e Prospero Ano Novo ✶ Iloista Joulua Ja Onnellista Uutta Vuotta

Buon Natale e Capo d'Anno ✶ 新年おめでとうございます

God Jul och Gott Nytt År ✶ Srećan Božić I Nova Godina

Merry Christmas and a Happy New Year

Maligayang Pasko at Masaganang Bagong Taon

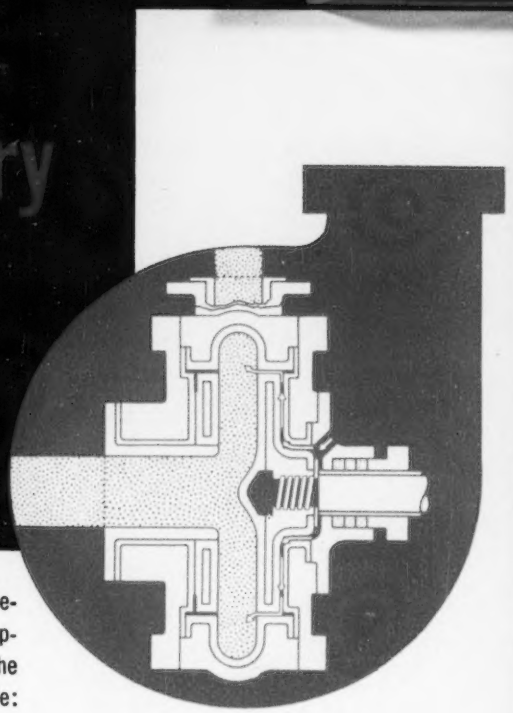
God Nytår

Glædelig Jul

Веселого Нового Года

TO MINERS EVERYWHERE

The Inside Story OF PUMP ECONOMY



Million-ton-plus performance on harsh abrasives, with no appreciable loss in efficiency, capacity, or head . . . low power consumption . . . simple, inexpensive maintenance. Here are some of the design features of Hydroseals that make these results possible:

High Efficiency—Clear sealing water protects close clearances from abrasive wear. Initial high efficiencies are thus maintained throughout pump life. No adjustments, take-up, speed changes, etc., are necessary.

Power Savings—Maintained efficiency means that you don't need to install an oversize pump and motor in order to allow for wear. Power costs are reduced as much as ⅓ to ½.

Long Life—Abrasives bounce off the super-tough Maximix Rubber Parts, which outlast metal 4 to 6 times or more. Special alloys are used for coarse material service. Heavy-duty, anti-friction radial and thrust bearings are standard.

Easy Maintenance—All Maximix Rubber Parts are moulded to shape and are mechanically locked into correct position . . . no cementing or vulcanizing is needed. Your own men can make any repairs quickly in the field.

Low Cost Replacements—Besides being low in cost, Maximix Rubber Parts weigh 80% less than equivalent metal parts . . . easy to handle, inexpensive to ship.

Compare these advantages with those of any other abrasives-handling pumps, and you'll see why so many milling engineers like to have Hydroseals working for them. Write for Catalog No. 451.

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Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives in Most Principal Cities

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

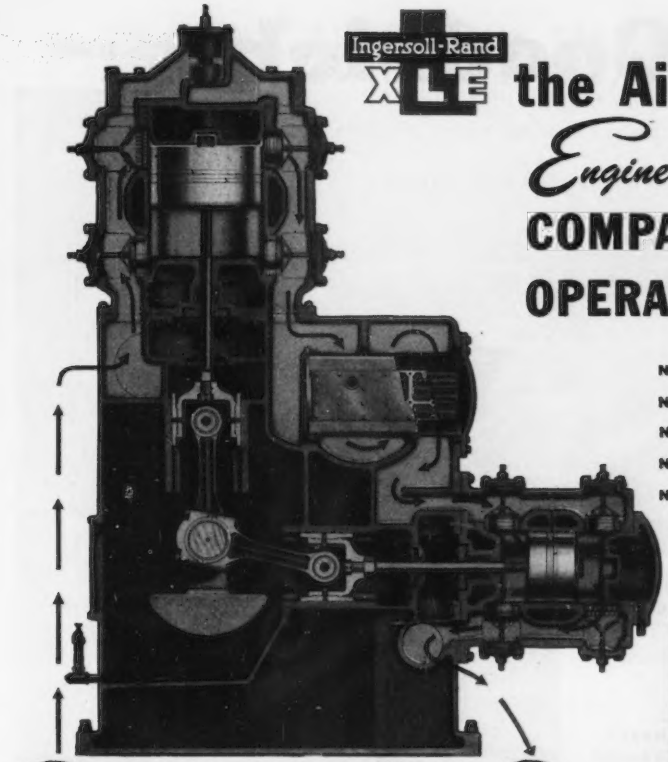
HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

Ingersoll-Rand

XLE the Air Compressor

Engineered for

COMPACTNESS AND OPERATING ECONOMY



NEW *Air Flow* DESIGN
NEW *Intercooler* DESIGN
NEW *Cylinder* DESIGN
NEW *Frame and Running Gear* DESIGN
NEW L DESIGN

PIPELESS THRU-FRAME AIR FLOW

Main air connections on the compressor frame eliminate piping strain from the cylinders. Air flow between these two points is entirely within the frame and cylinders. There is no interstage piping. The streamlined frame houses the intercooler and combined with the wide-flanged cylinders provides a sturdy construction that maintains alignment.

Packaged design for minimum floor space, and specially balanced for minimum foundation . . . ideal for skid-mounting.

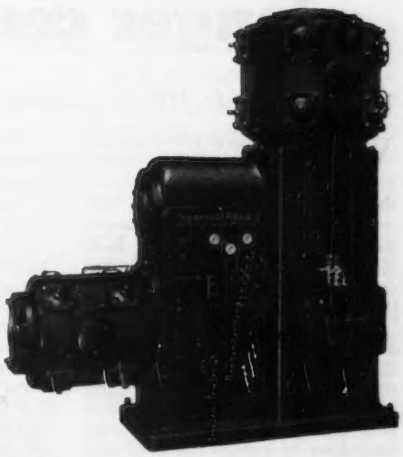
Easy to operate . . . push button starting, grouped controls, automatic force-feed lubrication, automatic condensate removal, automatic air-operated starting unloaders and capacity control.

Easy to install or relocate . . . ready-to-run, assembled shipment . . . simplified air and water piping.

Easy to maintain . . . simplified long-life construction . . . full-floating, cool-running, aluminum-alloy bearings that require no adjustment . . . no need to open the sealed crankcase which stays clean inside . . . streamlined exterior also easy to keep clean.

Low operating costs . . . new high-efficiency, long-life I-R Channel Valves result in compressor efficiency comparable to the largest units . . . durable, high-efficiency tube-and-fin intercooler saves water . . . efficient direct-connected motor.

Built for reliable, continuous full-load service . . . sizes 125, 150, 200, 250, 300, 350 horsepower . . . discharge pressures 80 to 125-psi, two stage . . . write for more information today.



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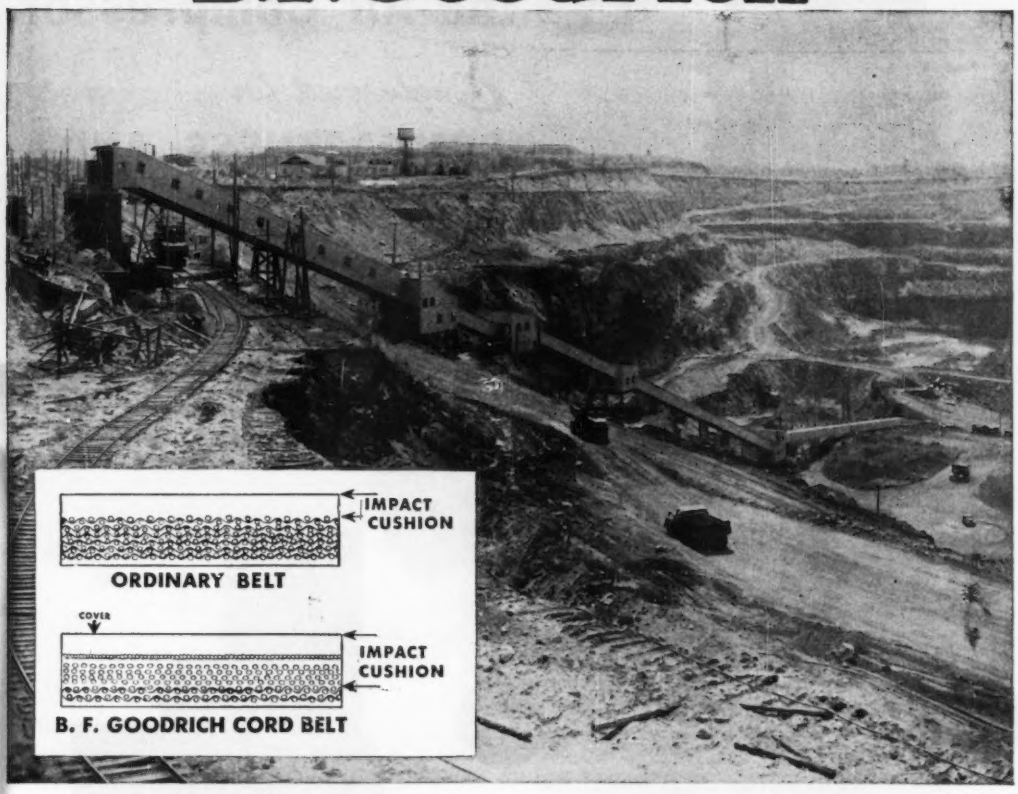
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Cord belt for tough jobs, longer centers, higher lifts

Gives 2 to 6 times greater impact resistance

WHERE you have heavy impact, long centers, high lifts, there's a special belt for your installation — the B. F. Goodrich cord conveyor belt:

Cord belt stands more impact — Each lengthwise cord in a B. F. Goodrich cord belt is completely surrounded by rubber — no cross threads tie them together. Cords are free to "give" when impact occurs. Rubber distorts temporarily, distributing and absorbing a shock that would damage stiff, unyielding plies. As an extra protection, B. F. Goodrich has added a patented *Transcord Breaker* — an extra layer of parallel cords in rubber, placed across belt width. Acts as a shock absorber, stretches to prevent gouges and cuts from splitting belt cover.

Cord belt troughs better — There being no crossweave in the cord plies, cords are free to flex. Belt conforms to idlers, pulleys. Spillage is reduced, troughing is natural and belt keeps centered on idlers, sustains less damage, requires less maintenance. Longer centers, higher lifts can be used.

Cord belt at work — Inside the housing shown here, a 3,000 ft. B. F. Goodrich beltroad handles iron ore in one of the largest mines on the Minnesota Iron Range. Installed in 1946, this belt has handled over 10 million tons. Estimated life is 10 more years and 30 million tons or more.

Cord belts for tough jobs—If your belts must take severe impact on loading, cutting and gouging at the loading chute, exposure to moisture and acid materials, heavy loads, you need B. F. Goodrich cord belts. Your BFG distributor will show you how they can save you money. *The B. F. Goodrich Co., Industrial & General Products Division, Akron, Ohio.*

Conveyor Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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EFFICIENCY UP...

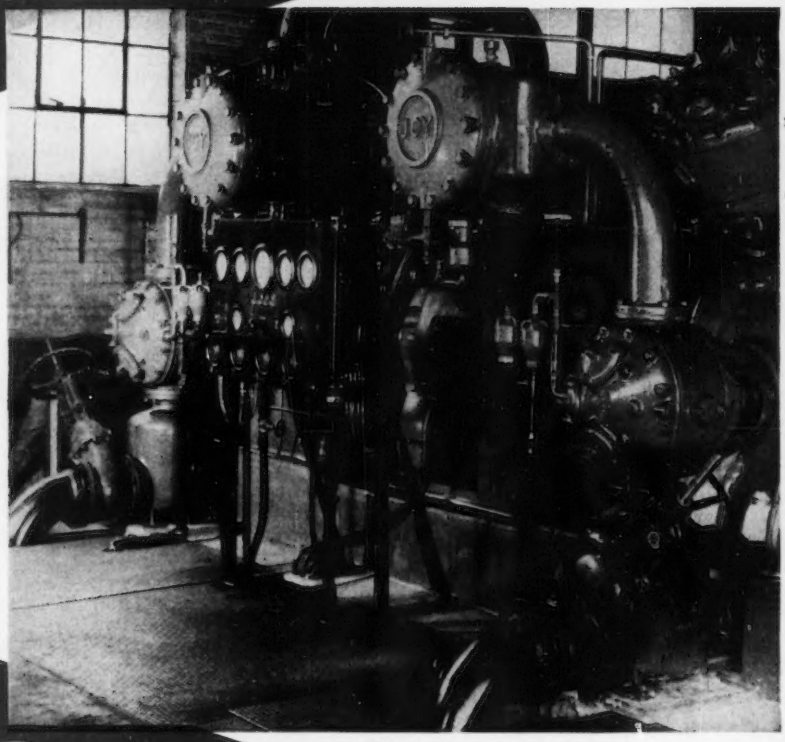


Photo courtesy Joy Manufacturing Co.

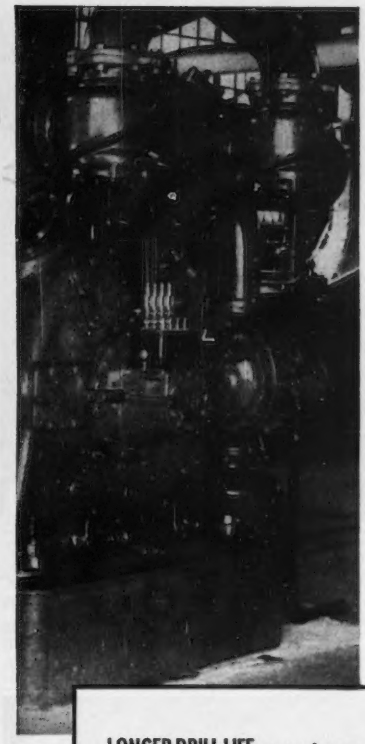
COSTS DOWN...

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

TEXACO

TEXACO

. . . when you use Texaco air compressor oil



LONGER DRILL LIFE, more footage drilled, lower costs — count on these benefits when you use *Texaco Rock Drill Lubricant EP.* This series of "extreme pressure" lubricants give full protection against wear, guard against rust whether drills are running or idle.

EFFICIENT, economical air compressor operation requires an oil that is *exactly right* for your particular operating conditions. To meet this requirement you have only to use the recommended Texaco air compressor oil. A Texaco Lubrication Engineer will gladly help you.

- Under normal conditions, a Texaco *straight mineral* air compressor oil will assure clean operation, minimum wear, lower maintenance costs.
- Under conditions causing rust in cylinders, coolers, lines and receivers, a Texaco *rust-inhibited* air compressor oil will keep compressors and systems rust-free whether running or not.
- Where service conditions are extremely severe, a Texaco *heavy-duty* air compressor oil will prevent harmful formations of carbon and sludge.
- To combat excessive wear under "wet cylinder" conditions, a Texaco *compounded* air compressor oil will keep wear at a minimum.

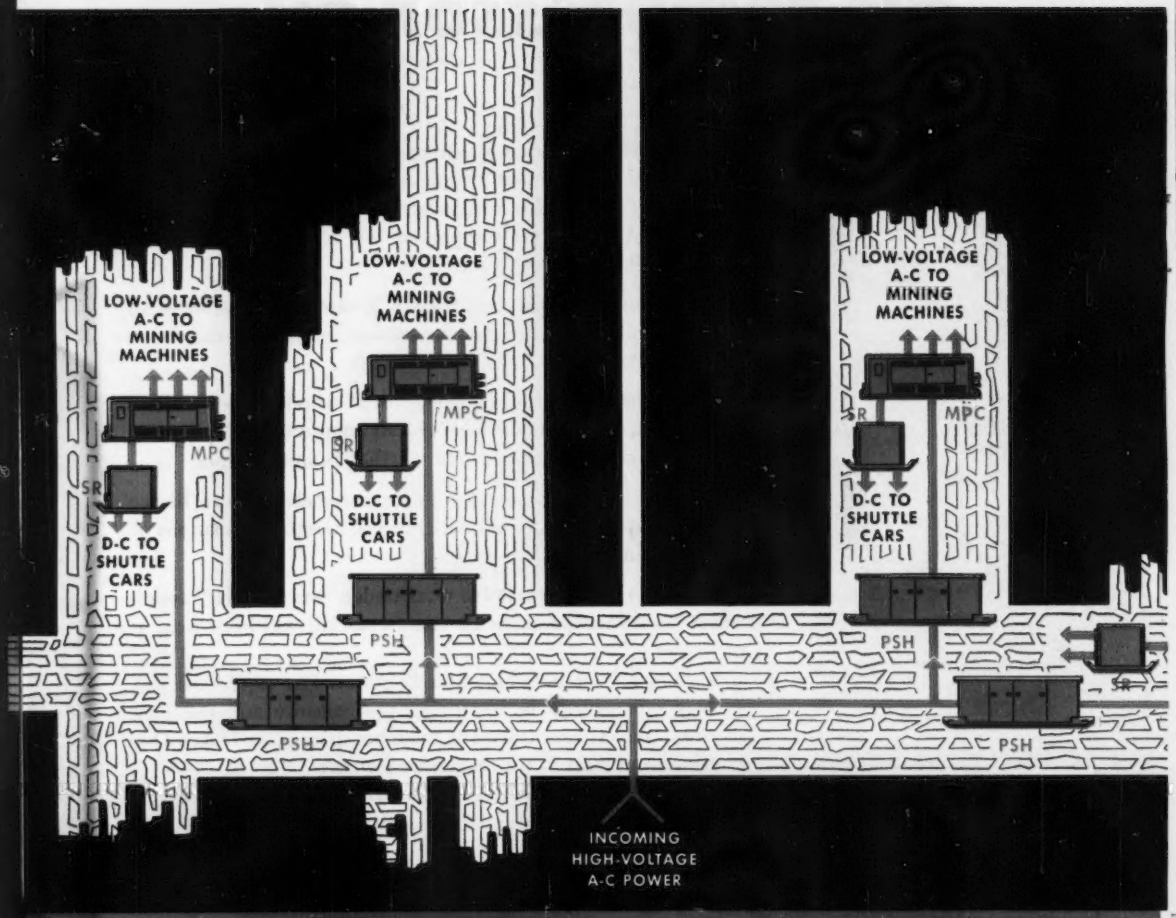
Call in a Texaco Lubrication Engineer. His experience can help you greatly in improving performance and reducing costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

More Copper Mining Equipment in the U. S. is lubricated with Texaco than with any other brand

Lubricants and Fuels

FOR THE MINING INDUSTRY



PSH—Portable Switch-house

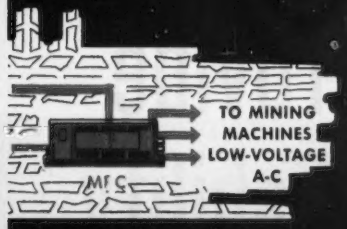
MPC—Mine Power Center

SR—Selenium Rectifier

Three new developments for A-C power systems

CONTINUOUS MINING STARTS WITH CONTINUOUS POWER

This new Westinghouse equipment keeps power supply dependable—keeps it near the working face. All three units are skid-mounted, compact and light in weight. The electrical connections are easy to make and break.



Here's the latest and best in power supply for a-c mining—three brand-new Westinghouse developments for use underground. Chart at left shows how they're applied.

1. New switch-house controls high-voltage power

High-voltage power comes down a shaft or borehole, then is sent out through individual feeders to the various working areas. Each feeder should be protected. Best way: the new Westinghouse underground switch-house. It immediately isolates the feeder in event of ground-fault, overcurrent or short circuit so that the rest of the system isn't affected.

2. Mine Power Center transforms it down

This new Mine Power Center keeps power supply where it's needed—close to the working face. Four working areas and four Power Centers are shown at left. This new unit is basically an air-cooled transformer with outgoing low-voltage feeders. A circuit breaker protects each feeder against overcurrent and ground-faults.

3. New rectifier supplies small blocks of d-c

Here's the ideal way to supply the small amounts of d-c needed in a-c mines. The new Westinghouse selenium rectifier takes a-c from the Power Center and supplies d-c through circuit breaker protected outlets. There are no major moving parts in this unit—the rectifier itself is a simple, static, plate-type device.

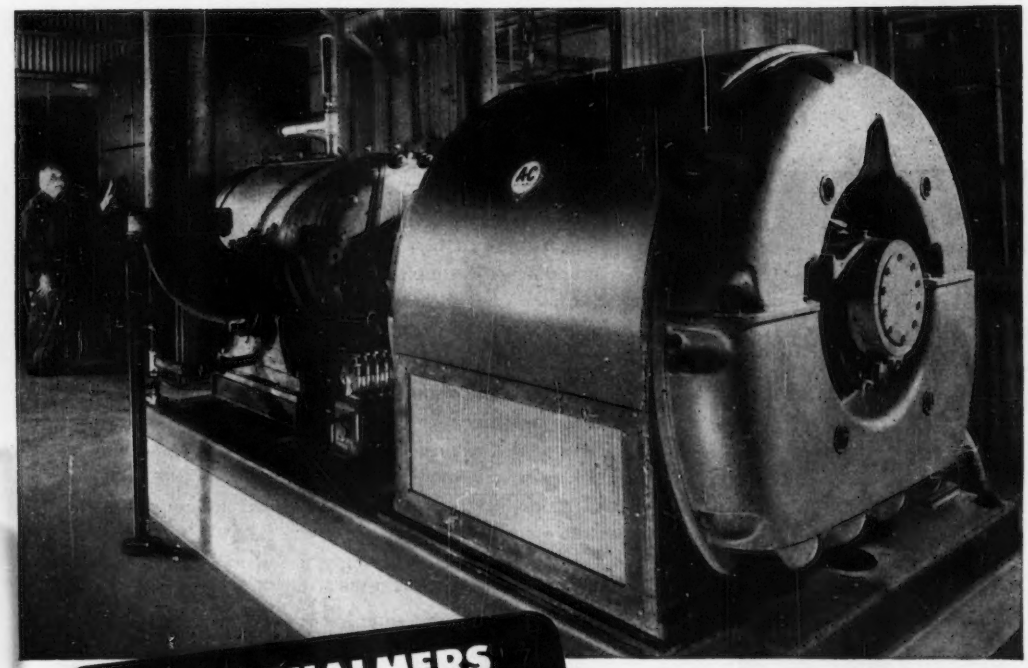
Call Westinghouse early on EVERY job

Westinghouse has a great deal of experience in all types of electrical equipment for mining. We can help you cut costs and improve your operations. When your next project comes up, call your Westinghouse office early in the planning stage. And for more information on these three new developments, write for B-5423. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-94901

YOU CAN BE SURE... IF IT'S Westinghouse

EQUIPMENT FOR THE MINING INDUSTRY

WESTINGHOUSE



All Allis-Chalmers installation: 250-hp, 495-rpm, drip-proof cage motor; single-stage rotary compressor; controller.

ALLIS-CHALMERS Large Motors ... Provide Low-Maintenance Reliability

START with construction features that have already earned a reputation for ruggedness and reliability. Add all-around drip-proof and mechanical protection. And do this without sacrificing accessibility for routine maintenance.

That's how Allis-Chalmers large cage motors were redesigned. That's why you'll want these advantages in your new motors:

IMPORTANT FEATURES

- Rigid cast-iron end shields assure you of correct bearing alignment and corrosion resistance as well as drip-proof protection.
- Capsule-type bearing housings enable you to leave the bearings and oil supply sealed against abrasive dirt when you remove the top halves of the end shields to clean the windings.
- Large air discharge openings in the yoke invite you to keep the ample passages back of the stator core clean and unobstructed. They also make installation easier.
- Louvers on air discharges and design of intakes keep foreign objects out of the motor.

A-3513

NEW BULLETIN

Built in ratings from 60 hp at 300 rpm to 1750 hp at 1800 rpm, these cage motors are described in detail in bulletin 05B7542A. Ask your nearby Allis-Chalmers representative for a copy, and see for yourself why these redesigned motors provide a new low in maintenance and a new high in reliability. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

triple play for profit

with P&H ELECTRIC SHOVELS

All three of these P&H Electric Shovels are at work for J. Robert Bazely at Pottsville, Pa. There are three sizes at work here — 4, 5 and 6 cu. yds., all delivering steadily at rock bottom costs.

P&H leads the field in Electric Shovel Developments.

It's the same pattern wherever these new P&H Electric Shovels go to work: The first machine sells the second — the third — and more.

The reasons are plain and simple — *better performance — bigger production — lower tonnage cost.*

Reasons behind the reasons are such advantages as P&H Magnetorque* which powers hoisting motions electro-magnetically — smoother, faster, more dependably . . . rugged all-welded construction with more strength to withstand shock loads . . . independent propel for quicker move-ups . . . stepless control which eliminates all contactor troubles . . . filtered air cab ventilation for less electrical down time.

The cold, hard facts that count are: *performance, production, low tonnage cost.* Figure your costs with P&H Electric Shovels and you'll find a convincing difference. It explains why every third P&H Electric Shovel sold is a repeat order.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

P&H ELECTRIC SHOVELS
4454 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

Every third P&H Electric Shovel sold is a repeat order

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • PRE-ASSEMBLED HOMES

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191-M
WESTERN
CONTRACTING
CORPORATION
GET THE DETAILS FROM

MARION 191-M • 10 cu. yds.

World's Biggest Shovel For LOADING BIG HAULAGE UNITS

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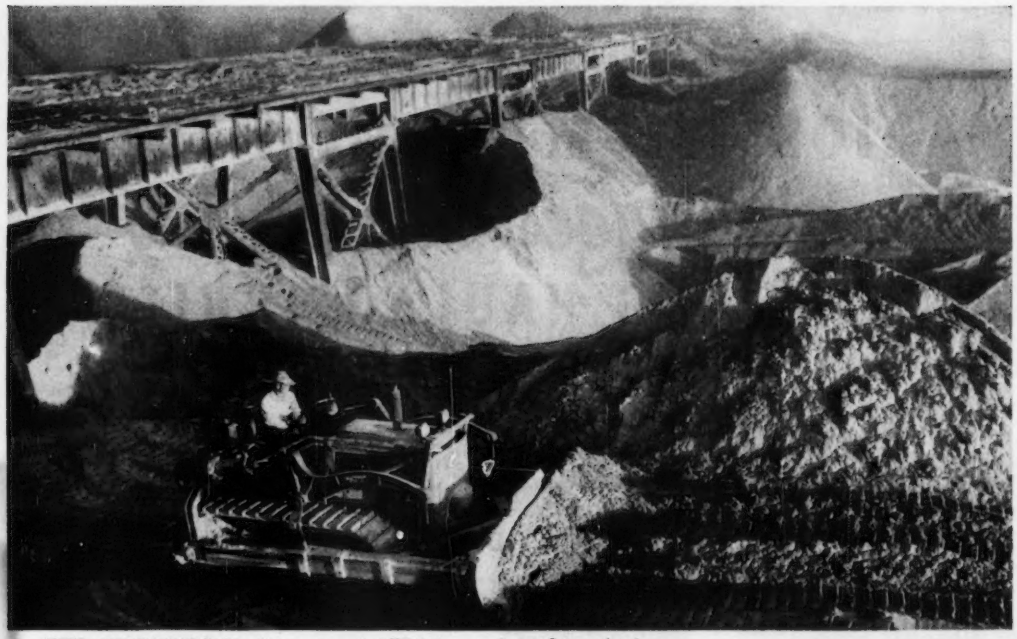


KEEPER OF THE STOCK PILE is a fast, power-packed TD-14A—one of many International models used to move the most material at the lowest possible cost.

King of the Phosphate Mountain

International crawler levels off both stock pile and operating costs for Davison Chemical Co.

The operator heads his International crawler into the huge phosphate stock pile and lets 'er go. He hits the mountain of mineral and leaves it flat behind him, marked with the tracks that show a TD-14A has passed.

At the great phosphate mines near Barton, Florida, the Davison Chemical Co. knows that rugged International power pays off in volume of work done and economy of operation. Besides the TD-14A on the stock pile, another TD-14A and a Big Red TD-24—both with winches as well as bullgraders—strip off overburden in the pits and string pipe for flushing phosphate to the plant.

International crawler tractors can serve you, too, with more payload moved per day at less cost per ton.

Check with your friends who already own International power. Ask your International Industrial Distributor for the details on the whole International line, and on the ready service he offers, in his shop and in the field. Get the whole low-down—and you'll go International from then on in!

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL
POWER THAT PAYS

INTERNATIONAL HARVESTER

Start with a REAL ROCK SHOVEL ...and you'll be sure to finish the job!

If you have a real Rock Shovel you'll never have to worry about output in any kind of digging. Start with a real Rock Shovel and you'll be sure to finish the job.

Northwests are proved Rock Shovels with advantages a Rock Shovel should have.

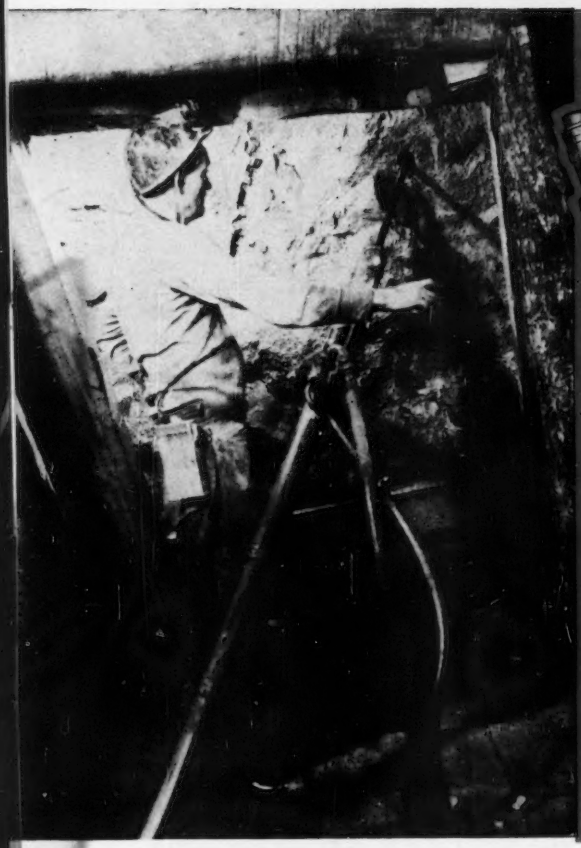
The Northwest Dual Independent Crowd utilizes force other independent crowd shovels waste. Cast Steel Machinery Bases and Cast Steel Machinery Side Frames are better able to take the strains of tough digging. The Cushion Clutch relieves all parts under power from shock loads and increases machine life and cable life. The "Feather-Touch" Clutch Control increases output, assuring easier operation and a *feel of the load* that makes it easier to handle the big ones. These are just a few of the many advantages you won't find in other shovels—just a few of the features that make money in the heart of the Rock Job. Put a Northwest in the *Key Spot* and be sure of the kind of service that makes one out of every three Northwests sold a repeat order.

NORTHWEST ENGINEERING CO., 1509 Field Bldg., 135 South LaSalle St., Chicago 3, Ill.

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

You get *DOUBLE DUTY



JOY TELESCOPIC FEED STOPERS

The S-91T provides a steel change of 36", compared with the 18" change of conventional stopers. In most mining conditions, this long feed will give more drilling time, with fewer steel changes and fewer lengths to stock.

At left, the Joy S-91T Stoper in operation; above, with telescopic feed leg retracted; right, with leg extended, giving a 36" drilling feed. Another feature, instant; "thumb-flip" rotation release, provides safety and easy spotting of holes.

JOY HAND-HELD DRILLS

A complete line of well-balanced, compact drills, ranging from 27 to 67 lbs. in weight.

The L-57 and L-67 Joy Hand-Held Drills are also available with mounting brackets for use as light drifters, or for wagon drill mounting.

Joy Jibs are hydraulically controlled booms for drill mounting on Jumbos, or on rubber-tired, self-propelled Drillmobiles.

JOY HYDRO DRILL JIB

Hydraulic control of all jib movements eliminates heavy lifting, and permits more accurate hole spotting for more efficient use of powder and controlled breakage.

1851—1951—100 YEARS OF ENGINEERING LEADERSHIP

with JOY DUAL-VALVE SILVER STREAK DRILLS

*Maximum Footage–Maximum Economy

In tunnels, crosscuts, drifts, or stopes, Joy *Silver Streak* Rock Drills with the DUAL VALVE will do your drilling job faster, and use less air with lower maintenance. Here's why—†

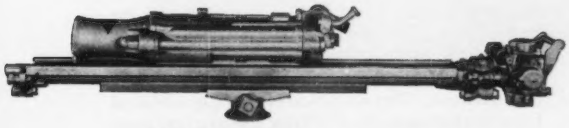
(1) The exclusive DUAL VALVE, a feature of all Joy rock drills, makes air do more work. By admitting the correct amount of air behind the piston and excluding air ahead of it during the drilling stroke, maximum force is exerted on the drill steel. There's no cushion of air ahead of the piston to reduce the force of the blow. Then the rear section of the Dual Valve meters the correct amount of air ahead of the piston to force it back with a "snappy" rotating action. This adds up to more power-packed strokes per minute, for faster drilling with less air.

(2) The silver-like cadmium plating on Joy *Silver Streak* Rock Drills aids lubrication while running-in, protects parts from rust while in stock, and keeps maintenance costs at a minimum.

The Joy line is complete. There's a *Silver Streak* rock drill for every rock breaking need. Shown here are drifters, stopers, hand-held drills, Hydro Drill Jibs. To complete the line, there are wagon drills; the QB-20 for line drilling and dimension stone quarries; rubber-tired, self-propelled Drillmobiles; and specially mounted drills for special needs.
● ***Let our Field Men work with you.***

JOY DUAL VALVE

"Makes Air do More Work"



JOY DRIFTERS

For column mounting, as at right, or for use on mobile jumbo units, Joy Drifters are built in three sizes—all with fast, powerful Dual Valve action. Efficient Pistonmotor Feed, with only two moving parts, provides strong, steady advancement and retraction. One-piece locking chuck increases bearing area and reduces wear on lock ring and chuck bushing.

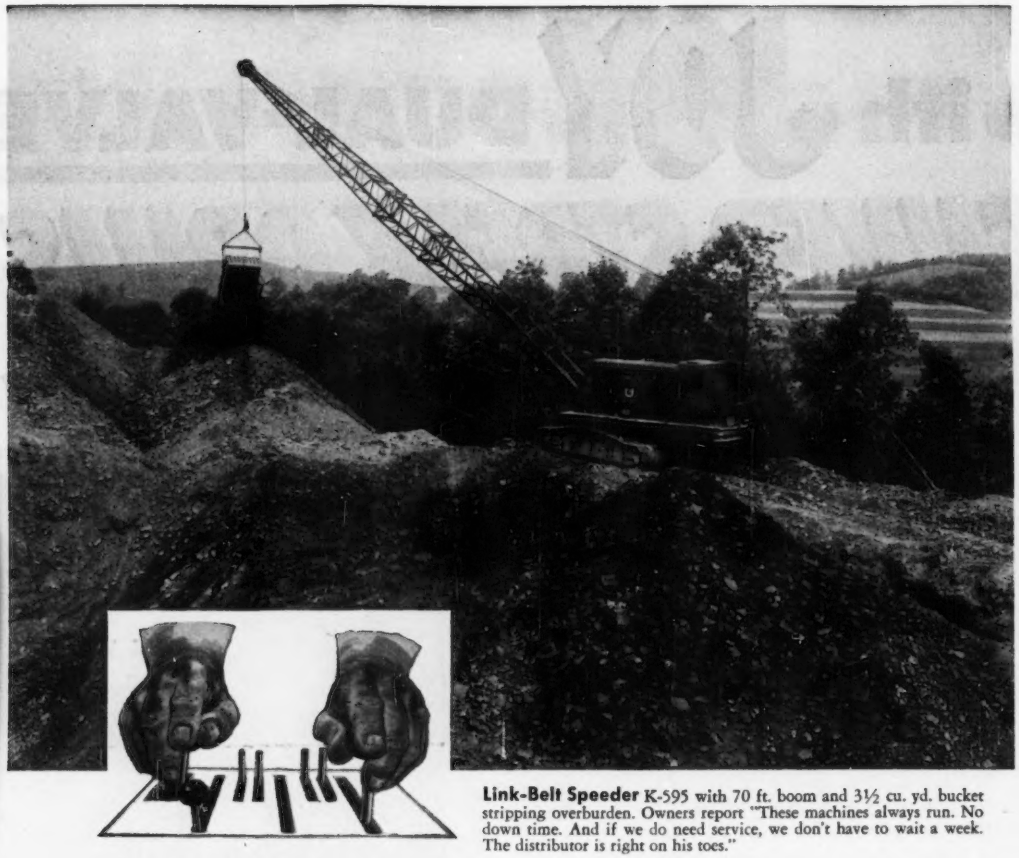
Consult a Joy Engineer

W&D 37

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



Link-Belt Speeder K-595 with 70 ft. boom and 3½ cu. yd. bucket stripping overburden. Owners report "These machines always run. No down time. And if we do need service, we don't have to wait a week. The distributor is right on his toes."

AT YOUR FINGER TIPS...

up to 25% increased output

WITH SMOOTHER, EFFORTLESS *Speed-o-Matic* CONTROLS

LINK-BELT SPEEDER

Fingers instead of muscles do the control-work on the Link-Belt Speeder K-500's. That's why operation of this Shovel-Crane is faster, surer, and easier. You get time-saving precision, too . . . "pin-point" placement of bucket, shovel or hoe, without drag, lag, jerk or jump. Control is perfect . . . you "feel" the load every inch of the way.

Operators praise the ease Speed-o-Matic power-hydraulic controls provide. Say they keep fresher, more alert even during long overtime. This pays off in greater output . . . up to 25% and more, and the kind of profits you like to see.

Introduced in 1936, Speed-o-Matic power-hydraulic controls have proved their superiority under toughest field conditions. They are typical of the many advanced features which make the K-500 the standout performer in its class. Depend on Link-Belt Speeders. They handle more work, more kinds of work, more of the time.

LINK-BELT SPEEDER
CORPORATION

12.571-A

Builders of the most complete line of shovels, cranes and draglines
CEDAR RAPIDS, IOWA

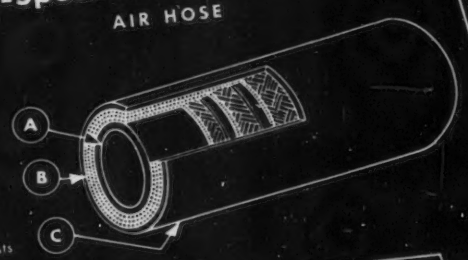
You can forget
CUTS and ABRASION
with these rugged hose twins

REDWING AIR HOSE

for rugged air service—direct connection to compressors. Goodyear's REDWING-H CORD AIR HOSE is covered with tire-tread-tough stock that's still soft and cushiony enough to resist heavy impacts—bounce away cuts and abrasion.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GTM-Specified REDWING-H CORD AIR HOSE



A Nonporous, seamless, flakeless tube resists lubricants in air stream

B Braids of high-strength rayon cords give extreme resistance to shock blows and tow-rope strains

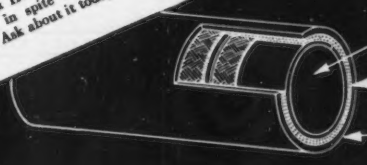
C Rugged, heavy-gauge cover resists abrasion

REDWING WATER HOSE

for heavy-duty road and building construction work. Covered with the same cushion-type stock, Goodyear's REDWING WATER HOSE gives long-lasting service in spite of impacts and abrasion. Ask about it today.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GTM-Specified REDWING CORD WATER HOSE



A Nonporous tube resists alkaline or slightly acidic water

B Braids of extra-strong, double-ended rayon cords

C Soft cover resists cutting, gouging and rough treatment

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS *built to the world's highest standard of quality, get in touch with the G. T. M.—Goodyear Technical Man—or phone your nearest Goodyear Industrial Rubber Products Distributor.*

GOODYEAR

THE GREATEST NAME IN RUBBER

Redwing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

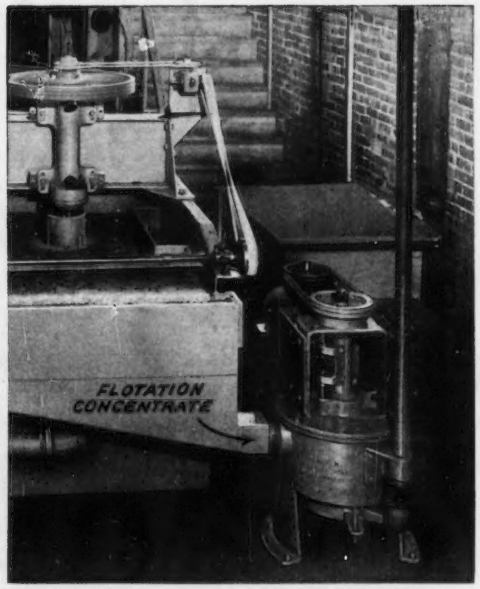
Note How DENVER

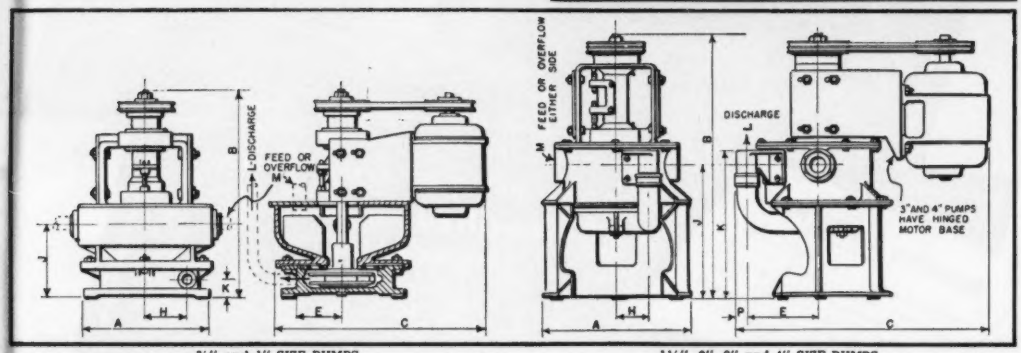
Vertical Sand Pumps

Handle Fluctuations in Feed

• No sump or feed head is required. Handles any material that flows by gravity. In fact, direct connection is possible as shown by photo. Concentrates from Denver "Sub-A" Flotation Machine go direct by gravity to pump bowl. Material falls on top of runner. Frothy concentrates, fluctuations in feed rate present no problem.

• Vertical design protects motor from splash. Long service from wearing parts. No stuffing box packing gland or sealing water necessary. Self-priming —overcomes stalling, plugging and air locks. Sizes: ¾", 1", 1½", 2", 3", 4".





¾" and 1" SIZE PUMPS — 1½", 2", 3" and 4" SIZE PUMPS

Pump Size	Capacity Based on 25% Solids By Weight: Gal. Per Min.	Dry Tons 24 Hr.	Discharge Head—Vertical Lift Plus Friction Head: 20 Ft. RPM	20 Ft. HP*	30 Ft. RPM	30 Ft. HP*	40 Ft. RPM	40 Ft. HP*	50 Ft. RPM	50 Ft. HP*	60 Ft. RPM	60 Ft. HP*	Dimensions—Inches: A	B	C	E	H	J	K	L	M	P	Approximate Shipping Weight Lbs.: Motor Drive***	Belt Drive**
¾"	15	27	1975	½	2385	1	.....	.....	.....	.....	.....	.....	12⅜	22¼	23	5⅜	3¼	7½	1⅞	⅜	1½	.....	315	220
1 "	30	54	1150	¾	1450	1½	1624	2	.....	.....	.....	.....	14½	23	27¾	4¼	4¾	8⅛	1⅞	1	1½	.....	490	328
1½"	75	135	1015	2	1230	3	1410	3	1570	5	1710	7½	26½	47⅞	35½	11	5⅜	23⅜	26	1½	3	1¾	1060	785
2 "	150	270	1000	3	1200	5	1370	7½	1520	7½	1660	10	26½	47¾	42	13	5⅜	23⅜	26½	2	3	2	1235	870
3 "	225	400	825	7½	925	7½	1035	10	1150	10	1250	15	42	63¼	65¼	25¼	6½	30⅛	31⅛	3	6	3¾	2500	.....
4 "	450	800	690	10	775	15	855	15	930	20	1015	20	42	63¼	69	26	8	30⅛	31⅞	4	6	4½	2800	.....

*Motor horsepower.
**Shipping weights are for largest motor recommended with highest discharge head shown in table.
***Furnished with vertical flanged pulley for flat belt, or mule drive attachment with round rubber belt for flat or V-Belt Drive.

FLOTATION ENGINEERS

DENVER • NEW YORK • CHICAGO • EL PASO

TORONTO. • VANCOUVER • MEXICO, D. F.

LONDON • JOHANNESBURG • RICHMOND, AUST.

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

"He lives that makes his friends happier, healthier, and wealthier"

DENVER EQUIPMENT COMPANY

1400 SEVENTEENTH STREET • DENVER 17, COLORADO

VP-5112

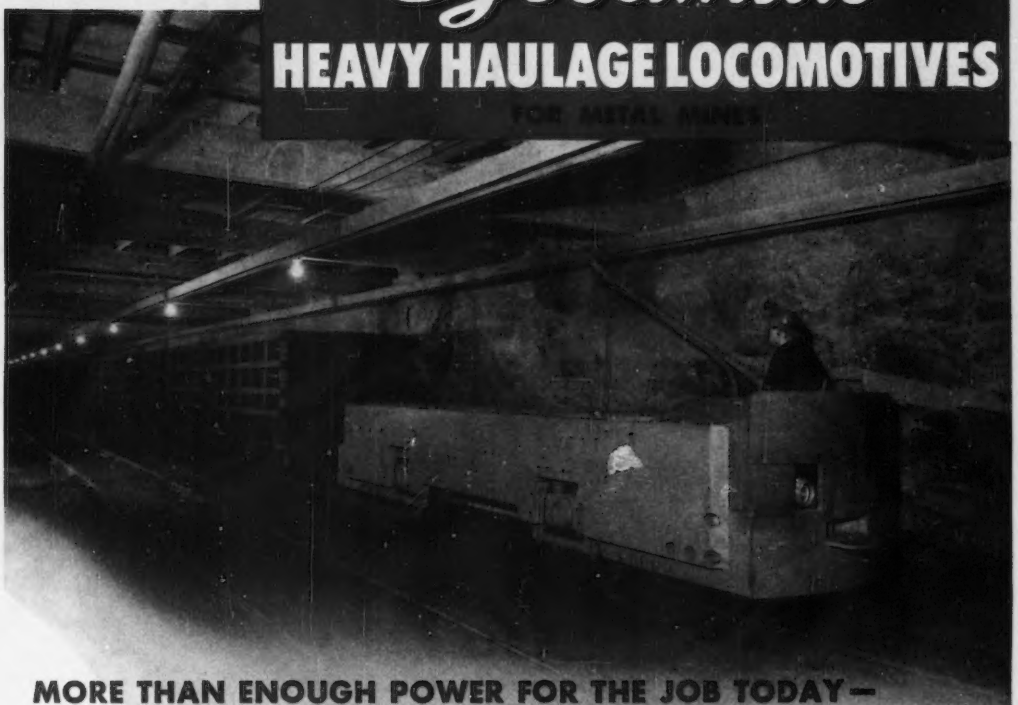
OVER 980 COMPANIES NOW USE DENVER VERTICAL SAND PUMPS

More than 24% of users are repeat customers. Most companies have several Denver Vertical Sand Pumps. There IS a solution to your frothy pulp or tailings pump problems. A letter outlining your requirements will bring you prices and delivery estimates without obligation.

Goodman

HEAVY HAULAGE LOCOMOTIVES

FOR METAL MINES



MORE THAN ENOUGH POWER FOR THE JOB TODAY— FULLY ADEQUATE FOR A BIGGER JOB TOMORROW

A fleet of these 20-ton, 240 horsepower Goodman Trolley Locomotives has been purchased by a large base metal mine. Capable management has provided these locomotives for handling large tonnages today, with plenty of capacity for the large tonnage and longer hauls that will be tomorrow's program.

If you can use a locomotive in your underground operation, there is a Goodman type to fit the job. Your inquiry is invited.

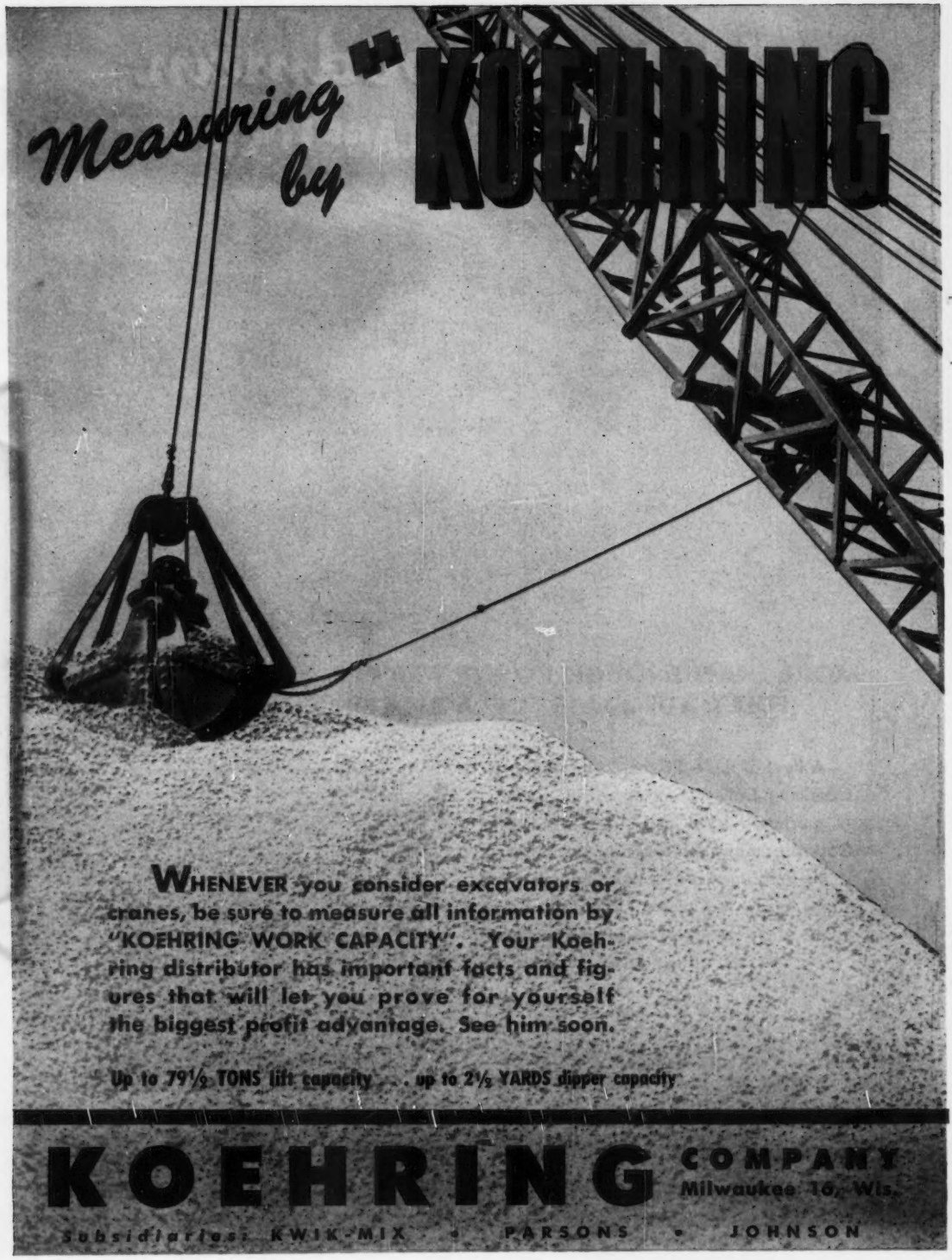
FEATURES THAT FIT THESE GOODMAN LOCOMOTIVES TO A HIGH SPEED, HIGH PRODUCTION MINE OPERATION

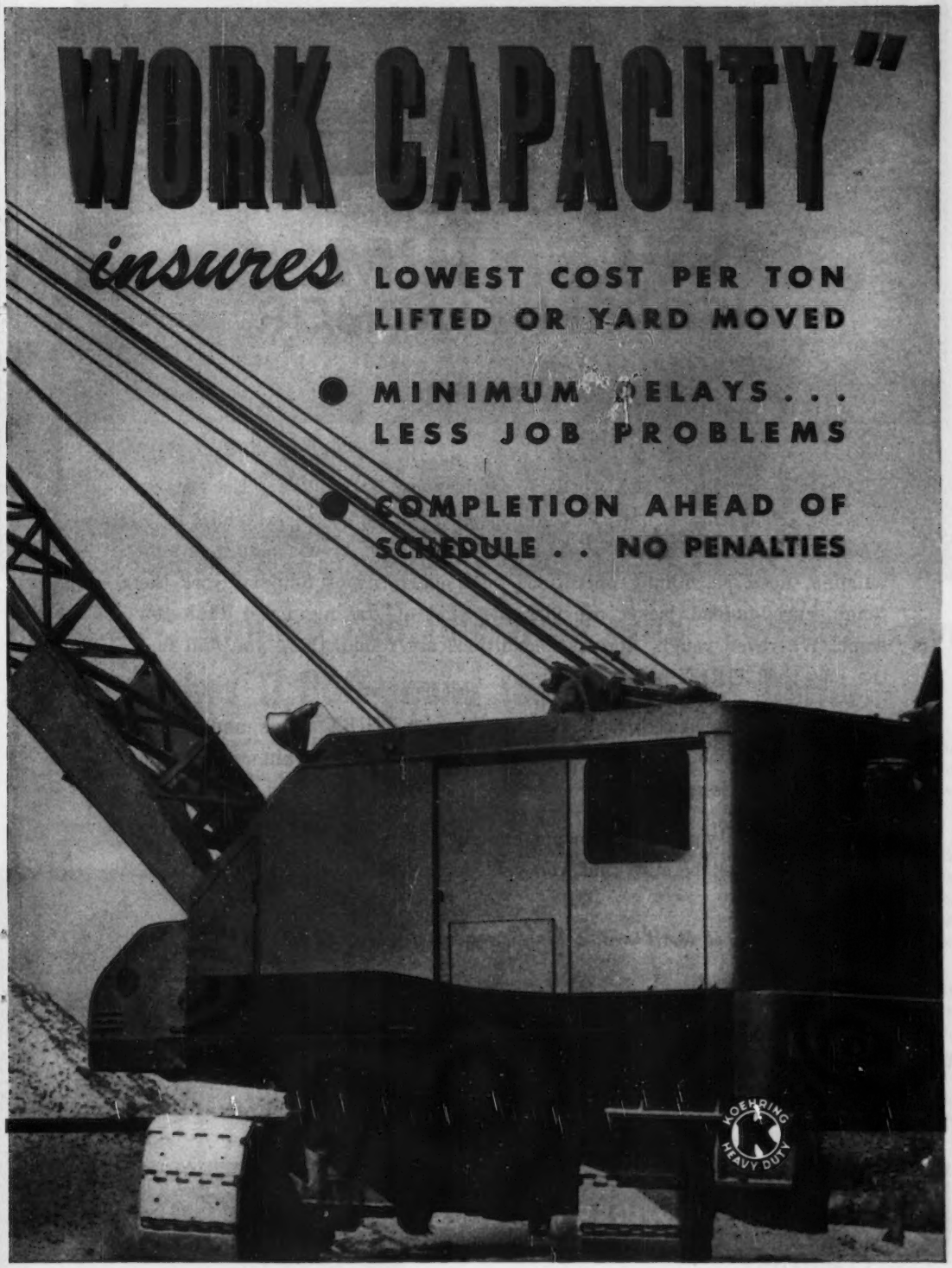
- Two motors—centrally hung, 120 hp. ea.
- Semi-magnetic control
- Roller bearing axle journals
- Transverse equalizers for top track performance
- Straight air and hand brakes, air sanders
- Running drawbar pull—approximately 10,000 lbs.
- Speed at running drawbar pull—8 mph.

Goodman MANUFACTURING COMPANY

HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES


Measuring by "KOEHRING"
WHENEVER you consider excavators or cranes, be sure to measure all information by "KOEHRING WORK CAPACITY". Your Koehring distributor has important facts and figures that will let you prove for yourself the biggest profit advantage. See him soon.
Up to 79½ TONS lift capacity . . . up to 2½ YARDS dipper capacity
KOEHRING COMPANY
Milwaukee 16, Wis.
Subsidiaries: KWIK-MIX • PARSONS • JOHNSON


WORK CAPACITY"
insures
LOWEST COST PER TON LIFTED OR YARD MOVED
● MINIMUM DELAYS . . . LESS JOB PROBLEMS
● COMPLETION AHEAD OF SCHEDULE . . NO PENALTIES
KOEHRING
HEAVY DUTY

ONLY TIREX HAS THE SELENIUM NEOPRENE ARMOR

Only Simplex-TIREX cords and cables are jacketed with the famous Selenium Neoprene Armor. This famous cured-in-lead jacket is well known wherever tough, hard jobs are found. Whether it is coal mining, ship building, open pit mining operations, rock quarrying or foundry work the tough, cured-in-lead jacket provides the kind of staying power that you want. Wherever rough, abrasive conditions are found, there you will find the jobs that TIREX excels at doing.

Actual service records show that Simplex-TIREX cords and cables have proved to be the most economical because the Selenium Neoprene Armor lasts so long.

Whenever your requirements call for the use of a portable cord or cable, specify and be sure that you get Simplex-TIREX Cords and Cables.

If it isn't made by Simplex it isn't Tirex

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.

Franklin County Coal Corporation finds

Thinner belt reinforced with "Cordura" rayon takes 11,000-pound tension, trains better

Hauls 300 tons an hour. Traveling 450 feet a minute up a 15° slope, this "Cordura" rayon reinforced belt (above) operates under total tension as high as 11,096 pounds. The belt is 890 feet between centers, lifts its big load 227 feet. To make starting easier, drive motor is fluid-coupled.

The big capacity belt is protected at loading point (below) by six rubber impact idlers under the surge bin.

Whether empty or fully loaded, this 36-inch slope belt at the Franklin County Coal Corporation Mine, Royallton, Ill., troughs well under heavy operating tension. It was manufactured by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., on a 3-ply cord carcass made of Du Pont Cordura* High Tenacity Rayon.

Why does a belt reinforced with "Cordura" trough better? Because "Cordura" rayon yarn is inherently stronger than yarn of natural fibers—so the reinforcing fabric can be thinner . . . of fewer plies . . . *yet stronger.* The resulting belt is thinner and therefore more flexible. Naturally it troughs better, has less tendency to crack and separate. And the low stretch of "Cordura" rayon saves expensive shut-downs for take-up and resplicing.

Slope conveyors are not the only installations on which such belts are better. "Cordura" rayon also gives mother belts strength and stretch resistance to operate over greater distance . . . often eliminating costly transfer points.

Before you order your next conveyor belt, inquire about the advantages of belts reinforced with "Cordura" High Tenacity Rayon. We'll be glad to send you names of suppliers . . . also complete information about "Cordura" in a new booklet "Sinews for Industry." For your free copy write: Rayon Division, Room 4421, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*REG. U. S. PAT. OFF.

Du Pont "Cordura" High Tenacity Rayon

STRENGTH AT LOW COST

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

WESTINGHOUSE
Life-Line
DO NOT LUBRICATE
WESTINGHOUSE
Life-Line motor
PAIRED FOR PRODUCTION
Life-Line starter

"SOLVED... our motor and control problems," say users of these Life-Lines

Read what users say about Life-Line motors and Life-Linestarters®.

"Our chemical plant operates 24 hours a day, 7 days a week. Life-Line has reduced shutdowns. We turn them on and forget them."

"Your Life-Linestarter is, in my estimation, an almost perfect mechanism. We were using other manufacturers' equipment which employed solder pot mechanisms. Much trouble was experienced in the field. It meant complete replacement of the ratchet assembly. Your bimetallic disc solved this trouble."

"We always accepted bearing troubles as a necessary evil in our cement plant. Fine rock and cement dust is everywhere. It gets into bearings and ruins them fast. Since we tried Life-Lines though, bearing maintenance is a thing of the past."

"In one of our ventilating fans the starter was unbearably noisy. To correct the situation a new coil was installed on two occasions, alignment of parts was checked several times—all to no avail. Then we tried a Life-Linestarter. Now all is quiet. It's the smoothest operating starter we have found."

"Although your pre-lubricated bearings have provided a big savings, the steel end brackets are the big money savers. Formerly, falling material broke cast brackets. Now Life-Line steel construction gives us continuous operation."

Typical? Yes—typical of thousands of such reports thoughout the country.

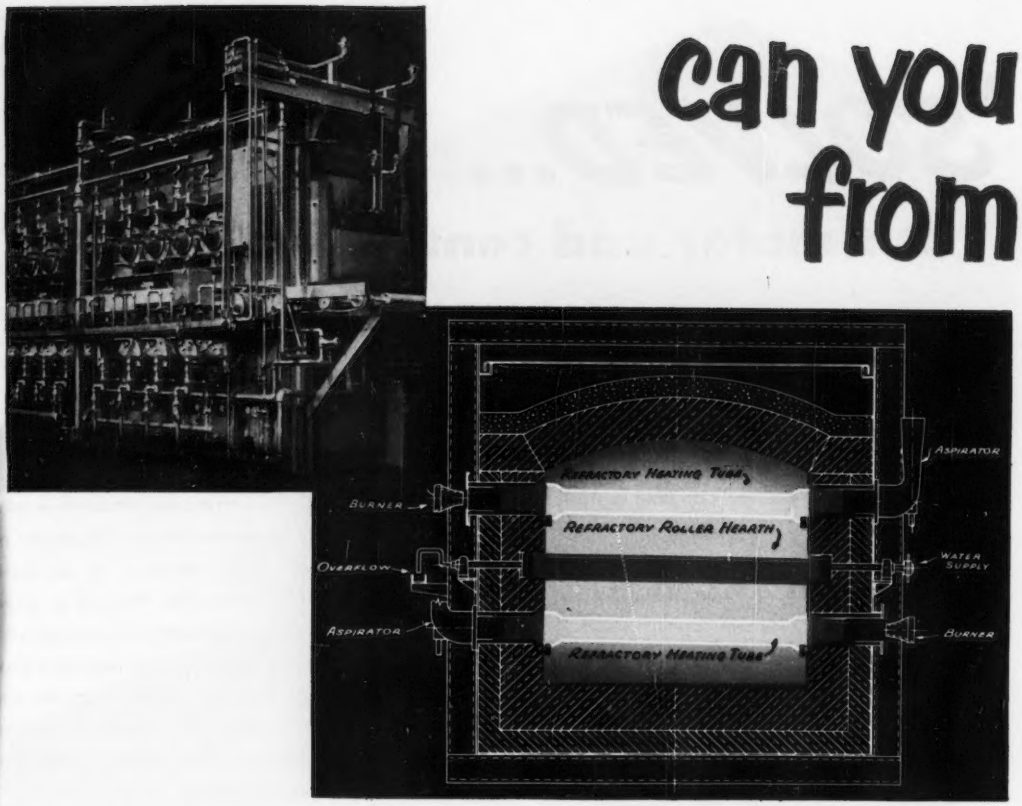
Why not get the production insurance these two offer? Ask your Westinghouse representative for complete details. There is a complete line . . . a motor or starter to fit any job in your plant. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21643

YOU CAN BE SURE... IF IT'S Westinghouse

Life-Line

MOTORS and CONTROLS

can you from



By using Super Refractories instead of alloys for radiant tubes and rollers, The Gas Machinery Co. opens up new applications for this furnace.

The furnace at the left is a controlled-atmosphere roller hearth furnace. Work, such as castings to be malleablized, moves through on rollers—is indirectly heated by radiant tubes above and below the hearth.

In furnaces of this type, the rollers and tubes are customarily made of heat-resisting alloy steel. Consequently, maximum operating temperature is about 1600 F. (Above this temperature, the strength and hardness of these steels fall off sharply.)

So, The Gas Machinery Company tried something different. Instead of metal, they used CARBOFRAX silicon carbide rollers and radiant tubes—a Super Refractory material made by CARBORUNDUM.

With these changes, temperatures of up to 2500 F, and more, become not only possible, but practical—and a whole new field of furnace usages opens up. Moreover, both the rolls and tubes last longer. In fact, the rollers (which used to sag and wear away) show hardly any signs of wear at all.

This application points up several properties of this highly unusual material. At elevated temperatures it *conducts* heat almost as well as heat-resisting alloy steels. It can be used at far higher temperatures than metals will stand—up to 3000 F

Super Refractories by

CARBORUNDUM

Trade Mark

Refractories Division — The Carborundum Company, Perth Amboy, N. J.

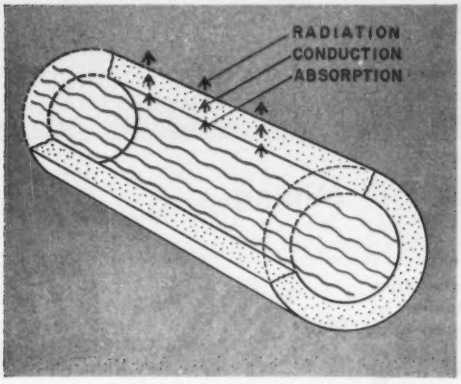
"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company

pick up any ideas this use of tubes?

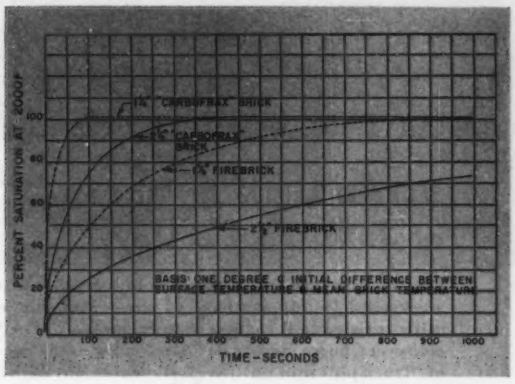
and higher. It doesn't scale, is very resistant to spalling and to heat shock. It is chemically inert—is little affected by the products of combustion—and is highly impervious to gases. It is also one of the most abrasion-resisting materials known. And it has the strength to support heavy charges, even at very high temperatures.

This illustrates the important thing about Super Refractories by CARBORUNDUM: They are not just "better" than standard fireclay refractories. They are actually a class apart—with distinctly different properties that have made possible distinctly new designs and processes. Once this concept is realized, possible applications are almost unlimited. The Gas Machinery Co., for example, now uses Super Refractories in several kinds of equipment, including an ingenious continuous catalytic gas reforming unit. Other companies also have developed interesting new equipment—designed around Super Refractories.

WHAT ABOUT YOUR OWN PROCESSES? We have a new booklet which outlines the unusual characteristics of these special-purpose materials. The coupon will bring you the story —or one of our engineers would be happy to talk over your specific problems. We believe it could be mutually profitable.



In indirect heating, absorption and emission factors come into play, as well as thermal conductivity. In both absorption and emission (and thus in radiating ability) CARBOFRAX tubes and shapes are superior to metal. They approach the high-temperature alloys in conductivity.

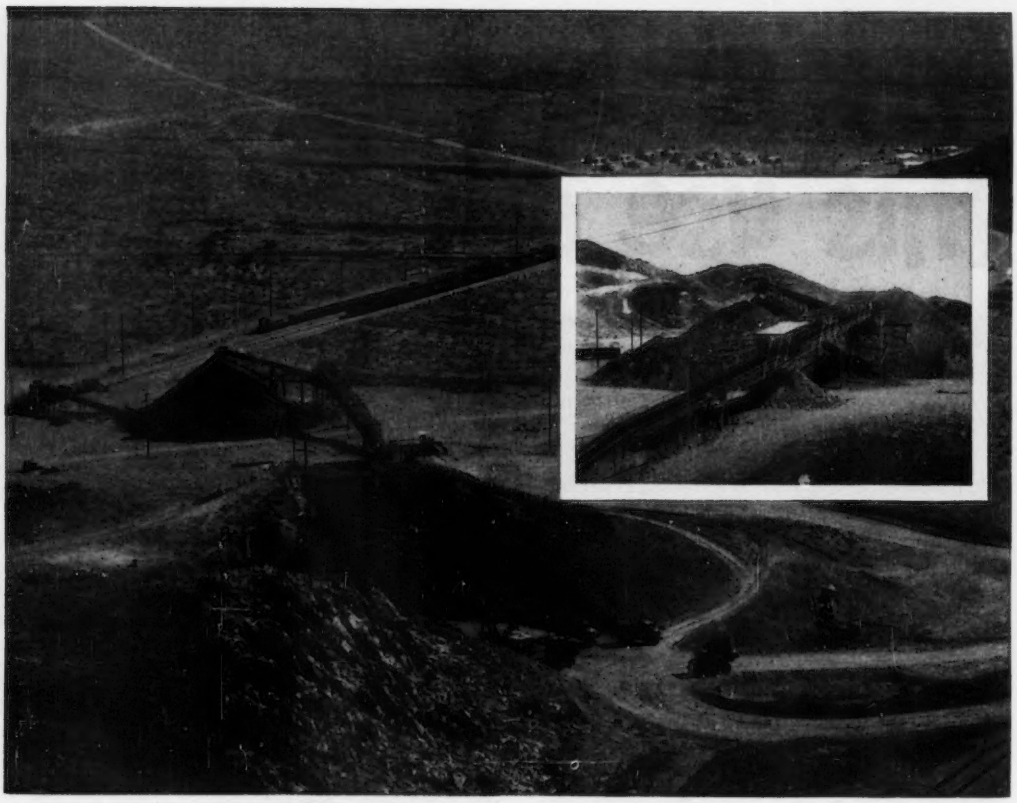


Thermal conductivity also plays an important part in checkers. A regenerator using CARBOFRAX brick for its checkerwork can be operated on much faster cycles—absorbing and releasing many times more BTU's per second. Also, higher temperatures, to above 3000 F if desired, become possible.

This advertisement — one of a series — is presented in the belief that in the unusual properties of Super Refractories by CARBORUNDUM lies the key to many new or improved processes. We would like to talk over specific jobs with anyone who sees such possibilities.

Dept. U-121
Refractories Div., The Carborundum Co.
Perth Amboy, New Jersey
Please send your free booklet on properties of Super Refractories.

Name_____
Position_____
Company_____
Street_____
City_____ **Zone**____ **State**_____



VITAL LINK in Modern "Truck Pit" Mining— *at 3500 Tons a Day*

Ore from an open cut is trucked to a crusher at the mine, then stock-piled in uniform reduced sizes—available for shipment by rail as needed to furnaces 166 miles away. Use of S-A heavy-duty conveyors, boom stacker and pan feeders in the operation is typical of "truck pit" mining. This fast, convenient high capacity installation for handling primary crushed ore was designed by S-A in co-operation with Kaiser Company engineers.

Installations like this are typical of the versatility of the S-A staff. In answering diversified conveying and bulk materials problems these men draw on 50 years of accumulated experience. Because Stephens-Adamson makes *all types* of bulk materials handling equipment, our engineers are free to recommend the best unit or combination of units for any specific need.

There's no obligation on your part in talking over your needs with S-A engineers. Write today!

KAISER COMPANY
Eagle Mountain Mine, Calif.

Primary crushed ore is fed to a belt conveyor by an S-A Amsco Manganese Steel Pan Feeder which carries it up to a pivoted stacking belt conveyor distributing over storage area. Ore is reclaimed through a tunnel under the storage pile. In turn, it is fed out over another pan feeder to a belt conveyor which moves it to a bin located over waiting gondolas.

1901-1951

50 years experience with bulk handling

STEPHENS-ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

ROCK RATED!

FOR HEAVY GOING

P&H *Magnetorque**

SLICKEST SWING YOU'VE EVER KNOWN!

It's everything you've wanted for more profitable rock handling . . . It's the P&H 955-A (2½ yd. shovel) . . . newer . . . better . . . proving it where the going is heaviest. Here's why:

P&H MAGNETORQUE ELECTRIC SWING. The smoothest, slickest swing you've ever known . . . yours for the full life of your machine. Old style swing frictions are *out* . . . all their troubles, adjustment and replacement costs.

SMOOTHER OPERATION means less strain on machine and operator. **GREATER STABILITY** gives you increased digging ability. **ALL-WELDED** for maximum strength.

Ask to see the one working nearest you. It's the 2½ yd. version of the famous 1055 (3½ yd.).

P&H **EXCAVATORS**
4454 W. National Ave.
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS & ELECTRODES • SOIL STABILIZERS • CRAWLER & TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

There's only one

TAPER-LOCK

Precision-Grooved

True Running

Easy on—Easy off

TAPER-LOCK bushing grips the shaft for the full length of the bushing — holds sheave with firmness of a shrunk-on fit. No wobble. Taper-Lock runs true!

No flange—no collar—no protruding parts. Flush machine-tool appearance.

Finest grade of close-grained semi-steel, cast in the Dodge foundry.

The grooves, machined on precision equipment, have identical pitch diameters. This insures equal belt tension. Every belt pulls its share of the load!

TAPER-LOCK sheaves are available from distributors' stocks in complete range of sizes in A, B, C and D grooves.

DODGE SEALED-LIFE BELTS have special protection for tension members, insuring longer belt life. Perfectly matched to TAPER-LOCK sheaves.

DODGE MANUFACTURING CORPORATION, 3100 Union Street, Mishawaka, Ind.

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

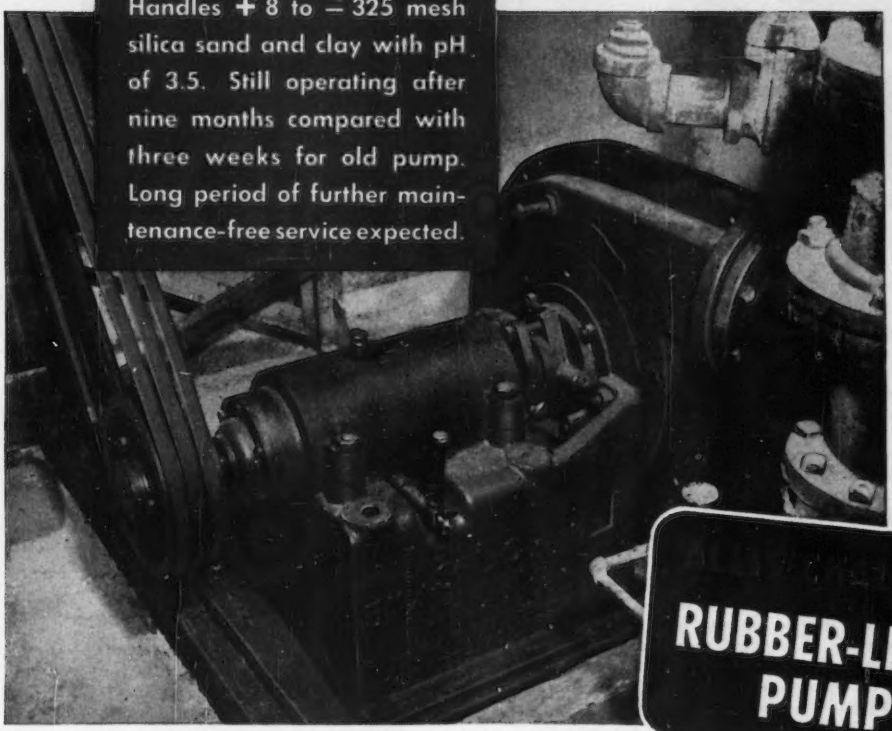
DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

13 TIMES LONGER LIFE

—THAN PREVIOUS PUMP!


Handles + 8 to − 325 mesh silica sand and clay with pH of 3.5. Still operating after nine months compared with three weeks for old pump. Long period of further maintenance-free service expected.
RUBBER-LINED PUMP

PUMPING WASTE FROM degritting operations in a Georgia clay pit wore out a high grade alloy pump every three weeks. This Allis-Chalmers SRL Rubber Lined Pump has been in operation over nine months without requiring any maintenance due to wear. And wear is so slight that no estimate can be made of its eventual useful life.

Such reliability and long wear make any pumping operation more profitable and are particularly important in 24 hour, 7 day operations like this one.

Up to 50 times the wear life of the highest grade alloy pumps is not uncommon where the Allis-Chalmers Rubber Lined Pump has been used to pump fine abrasive suspensions.

SPECIAL RUBBER COMPOUNDS

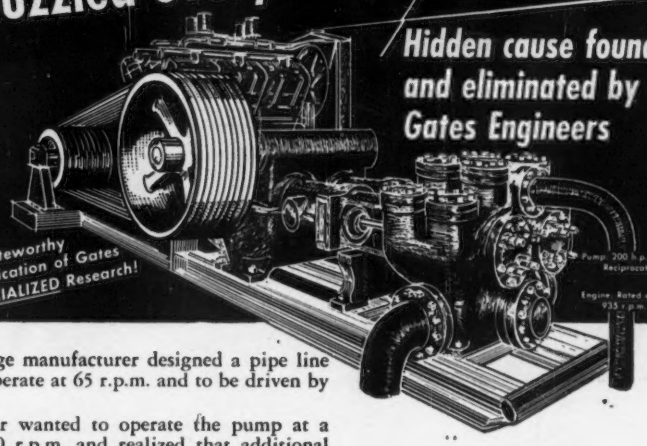
Rubber lining compounds are especially engineered for each application. Linings are bonded to separate steel frames and not to the pump body, so they may be replaced without removing the pump from its location. The impeller is equally easy to remove and replace.

If you are pumping fine mesh, hard, abrasive materials (⅛" to 325 mesh size), find out how much more life you will get from an Allis-Chalmers Rubber Lined Pump and how it will reduce your cost per gallon pumped on tough operations. Ask your nearby Allis-Chalmers District Office representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin and ask for Bulletin 08B7311. A-3536

ALLIS-CHALMERS

Severe vibration on pump drive puzzled everyone . . .

Hidden cause found and eliminated by Gates Engineers


A Noteworthy Application of Gates SPECIALIZED Research!
Pump: 200 h.p. High pressure Reciprocating
Engine: Rated at 246 h.p. — 935 r.p.m.

A large manufacturer designed a pipe line pump to operate at 65 r.p.m. and to be driven by 12 V-Belts.

A user wanted to operate the pump at a speed of 90 r.p.m. and realized that additional horsepower would be required. Upon checking the V-Belt drive, it was found that the additional belts required would increase the face width of the sheave and therefore the moment arm of the bearing load. Any increase in bearing load combined with the increased speed was distinctly undesirable and therefore the user sought some means of reducing the overhung weight and width of the sheave.

Learning that a *special* V-Belt had a sufficiently higher horsepower rating to gain the greater pump speed with *only 9 belts,* he had the drive re-designed to use these belts.

When installed on the job, the belts vibrated severely. At a speed somewhat below the desired range, the belts would fly completely off the sheaves. Operation was so rough that it was almost impossible to run the pump at all.

Gates Engineers were called in for consultation. Their analysis indicated that the particular belts used formed a *too-compliant* link between the pump and the engine. This allowed tortional vibration to build up to excess. Therefore, belts of *less compliance* would have to be used.

Accordingly, Gates Engineers wrote specifications for belts having the necessary h.p. rating but with the exact *degree of compliance* that would avert the vibration. These special V-Belts were built by Gates—installed—and the drive operates smoothly under all loads and at all speeds within the range.

The excessive vibration is gone. The clutch operates smoothly at any speed. And 13 additional pumps have since been equipped with identical belts—all operating most satisfactorily.

Gates ability to analyze and correct obscure drive difficulties is no accident—for Gates operates the largest V-Belt Testing Laboratories in the world. And Laboratory findings are carefully checked by tests made under actual field conditions. Finally, the *results* of these exhaustive tests are immediately reduced to *usable data* for the design of V-Belt drives to *perform whatever task may be required.*

Phone for a Gates Field Engineer

Only under exceptional circumstances, of course, will you ever need belts of special construction. But, more often, some drive in your plant may not be operating quite as it should. Or you may have a particularly difficult drive to design. Again, you may want to be sure what size and construction of V-Belts will give the most efficient and the lowest cost service on a certain drive. In any case, you have only to phone a Gates Field Engineer, *always near you* in all industrial centers.

Just look in your phone book under "Gates Rubber." A Gates Field Engineer will come right to your plant and put at your service the full benefits of Gates V-Belt knowledge and experience *without the slightest obligation!*

ENG-518

Gates
Hose V-Belts
Molded Rubber Goods
for Industry

VULCO ROPE DRIVES
ENGINEERING OFFICES AND JOBBER STOCKS IN ALL INDUSTRIAL CENTERS

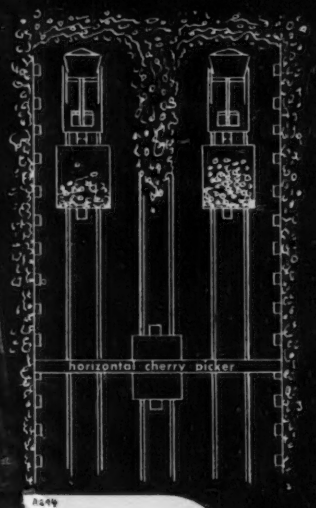
THE GATES RUBBER COMPANY
The World's Largest Makers of V-Belts
DENVER, U. S. A.

CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

FROM THE EIMCO FILE T231

WINGOHOCKING TUNNEL

A horizontal cherry picker was used in car switching. The empties came in on the center track and were moved in behind the loader as it brought out its load.



The Wingohocking flood control tunnel in Philadelphia, Pa. was driven 14 feet high and approximately 25 feet wide. Three tracks were laid parallel and two Model 21 RockerShovels were used on the outside tracks to clean up about 90% of the muck, then one machine was placed on the center track to finish up.

Eimco, alone, makes a full range of sizes in rock loading equipment. A size for every job. Eimco's can work efficiently in tunnels only 5½ feet high or other models do a fast, efficient job in large highway, hydroelectric or railway tunnels.

These rock loading machines are versatile. They may be moved easily from place to place or adapted to any system of track layout where track rolling equipment is used. The air powered models will work efficiently on lower air pressures in remote sections of the underground workings. This feature is especially necessary in long tunnels driven with no intermediate openings.

Large tunnels have also been loaded out effectively with multiple small units covering the face with a system of two or three tracks.

Eimco's pioneering experience in the field of rock loading makes it possible for them to build better, more dependable machines. Call Eimco before you select your equipment.

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK 51 52 SOUTH STREET • CHICAGO 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA. 3140 FAYETTE AVE • DULUTH, MINN. 216 E. SUPERIOR ST.
EL PASO, TEXAS MILLS BUILDING • BERKELEY, CALIFORNIA P. O. BOX 240
KELLOGG, IDAHO 307 DIVISION STREET

IN FRANCE SOCIETE EIMCO PARIS, FRANCE
IN ENGLAND EIMCO, GREAT BRITAIN LTD LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

LONE STAR STEEL

It takes Tournadozer only 45 minutes to clean around 4 draglines and a shovel over a 1.3 mile distance.

With forward speeds up to 15 m.p.h., Tournadozer moves earth clean-up runs rapidly and economically. Its high forward speeds and convenient-mesh transmission help the [illegible] crawler production on short and intermediate runs.

After 3000 hours work in highly abrasive materials, substantial part of original tread still remains on Tournadozer's 21.00 x 25 low-pressure tires. After further use, these tires will be re-treaded for additional mileage.

LETOURNEAU LET EQUIPMENT

R. G. LeTOURNEAU, INC.,

PEORIA, ILLINOIS

replaces 3 crawlers with 1 Tournadozer

"Very fine for clean-up work," says Supt. W.L.KENDRICK

Texas' largest pig iron producer, the Lone Star Steel Co. of Dallas, has greatly simplified and speeded clean-up operations at their Daingerfield open pit mine by replacing three 144 h.p. crawler tractors with 1 high-speed rubber-tired 186 h.p. C Tournadozer.

The 19 m.p.h. Tournadozer regularly serves 3 to 5 draglines and shovels . . . while, previously, each crawler could clean up around only 1 or, at the most, 2 excavators. In addition, Tournadozer handles a lot of widely-scattered dozing jobs . . . is literally all over the mine, 16 hours a day, 6 days a week, helping keep daily ore production at scheduled 15,000 tons. As W. L. Kendrick, Lone Star's division superintendent and a veteran of many years on the Mesabi Range and at Daingerfield, describes it:

"For our work, where speed, mobility and power are essential, Tournadozer has proved very satisfactory. It's a fine machine for cleaning up around shovels, pushing trucks in soft footing, and doing miscellaneous dozing. We are very pleased with its performance."

These "miscellaneous" tasks at present include: blading and cleaning haul roads . . . dozing overburden . . . cutting ramps from haul roads to loading areas . . . preparing dragline sites . . . and hauling equipment. Material ranges from rock and heavy limonite ore (weighing over 4,100 lbs. per cu. yd.) to sand, clay, and even gumbo. Tournadozer does particularly well in pushing trucks through soft going, because its speed and the smooth control of its instant-shift transmission keep it pushing steadily against truck as footing improves and haul speed increases.

3000 hours, 90% efficiency, tires still good

With 3000 hours of rugged service on these tough, high-speed assignments, Tournadozer has given over 90% efficiency. Despite the abrasive, rocky materials, the "C's" 21.00 x 25 low-pressure tires *still carry a substantial part of their original tread* (see photos). After additional wear, the tires will be re-treaded.

This is just one of a series of world-wide jobs where rubber tires, *rolling on dirt*, sand, rock and ore, are proving far more productive and economical than tracks *wearing in dirt*. See your LeTourneau Distributor for all the facts . . . let him demonstrate to you that frequent and costly track repairs can be eliminated. Let him show you how Tournadozer's 19 m.p.h. speeds, its simple steering controls, and electric-controlled down-pressure blade will move more dirt at a lower cost.

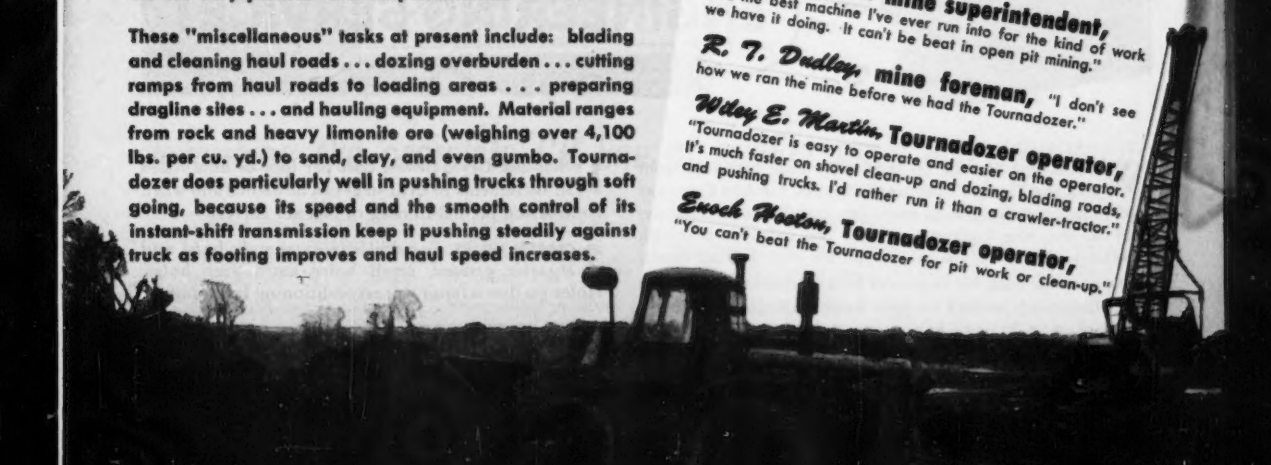
READ WHAT MEN WORKING THIS JOB SAY ABOUT TOURNADOZER

***M. J. Hughes*, mine superintendent,** "It's the best machine I've ever run into for the kind of work we have it doing. It can't be beat in open pit mining."

***R. T. Dudley*, mine foreman,** "I don't see how we ran the mine before we had the Tournadozer."

***Wiley E. Martin*, Tournadozer operator,** "Tournadozer is easy to operate and easier on the operator. It's much faster on shovel clean-up and dozing, blading roads, and pushing trucks. I'd rather run it than a crawler-tractor."

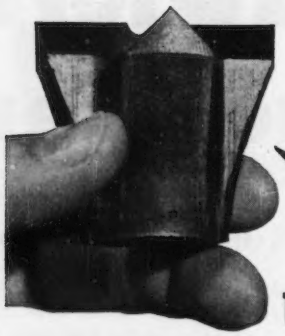
***Enoch Hooton*, Tournadozer operator,** "You can't beat the Tournadozer for pit work or clean-up."



186 h.p. Tournadozer moves 2½ cubic yards per push. Optional down-pressure blade and torque converter are available on current production.

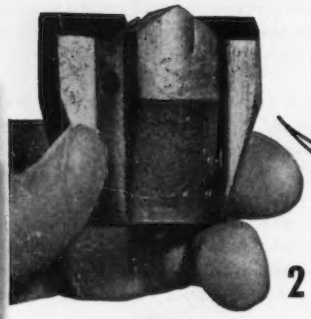
Tournadozer—Trademark Reg. U. S. Pat. Off. 8254

HIGH-SPEED, RUBBER-TIRED EXCAVATING • HAULING • LIFTING EQUIPMENT



1

ONLY THE **TIMKEN** COMPANY OFFERS



2

ALL 3 ROCK BIT TYPES...

3

AND A COMPLETE ROCK BIT ENGINEERING SERVICE!

WHAT type of rock bit is best for your particular job? Ask the Timken Company! *Only* the Timken Company makes *all 3 rock bit types*... multi-use, carbide insert and one-use! So only the Timken Company can help you make an unbiased selection of the *one* best bit for your drilling needs.

Because our rock bit engineers have all three types to draw from, they can give you a *complete* Rock Bit Engineering Service. Backed by 20 years' experience in solving rock bit problems, they'll give you the bit performance you're after, whether it's lowest bit cost, lowest cost per foot drilled, greatest possible drilling speed, or any other desired advantage.

1 MULTI-USE. Gives lowest cost per foot of hole when full increments of drill steel can be drilled and when control and reconditioning of bits are correct.

2 CARBIDE INSERT. For drilling extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

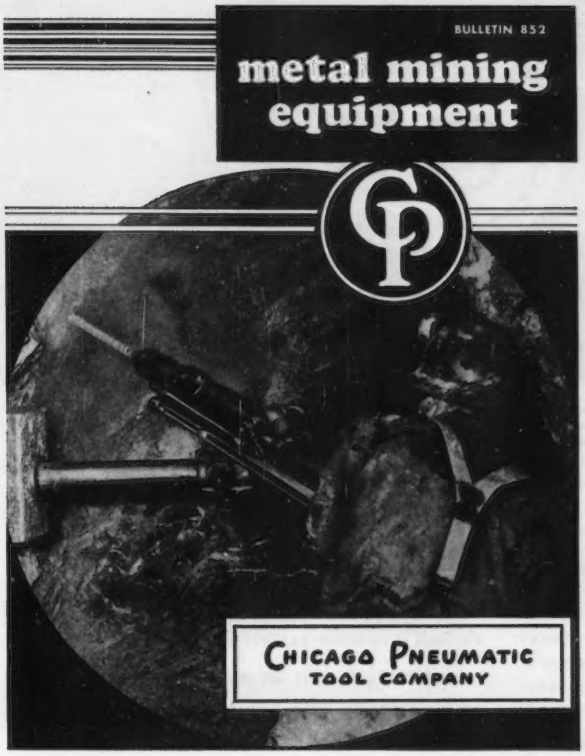
3 ONE-USE "SPIRALOCK". For use where reconditioning is not feasible. Gives lowest unit cost of the three types. "Spiralock" union holds bit on dependably, permits easy removal.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit... for every job

FREE BOOKLET! *A valuable guide for rock bit buyers. Shows and describes full line of bits. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".*



Get your Copy

describing the complete CP line of mining tools and equipment

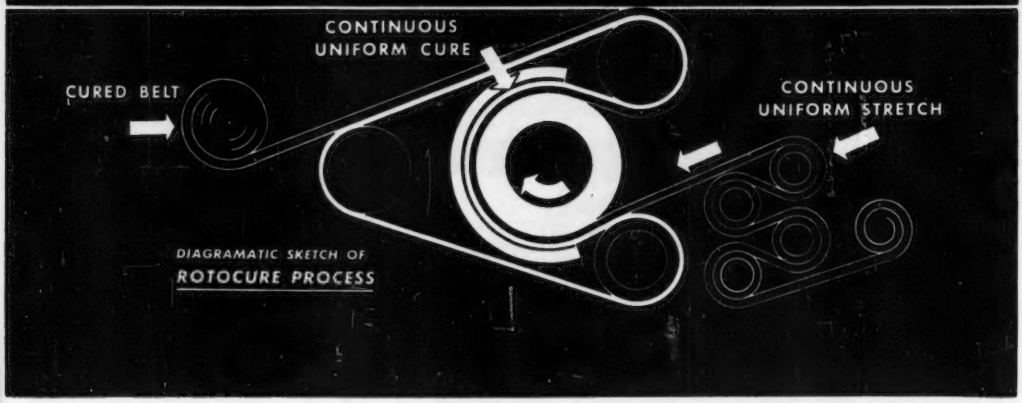
Just issued, this new bulletin describes CP Drifters, including MOTORdrifters and ROTORdrifters... a complete line of Sinkers, including the CP-59 with its 4-in-1 backhead . . . Stopers for medium and heavy duty . . . air-driven Diamond Drills for underground blast hole or exploratory drilling . . . gasoline, Diesel or electric Diamond Drills for exploratory drilling from the surface . . . Drill Jumbos, for faster tunnel driving . . . Wagon Drills, for open pit mining . . . the world's largest line of Demolition Tools . . . Maintenance Tools and Winches . . . Rock Drill Accessories.

Write for copy of Bulletin 852

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

They're CONTINUOUSLY Right!



(No "Start and Stop" Curing--No OCS* with BWH ROTOCURED Belts)

In industry, attaining uniformity of product is a primary objective of those who buy and those who sell. *But you can't get it in conveyor belts made by conventional flat press methods!*

WHY CONVENTIONALLY-MADE BELTS ARE VULNERABLE

In flat press curing, overcured segments due to press overlaps occur every 30 to 40 feet. These segments (2″ to 4″ wide across the entire belt) result because vulcanization is not continuous — sections cured earlier advance less than a full press length. The weakened structure due to overcuring invites operational weaknesses and is a major reason for early belt failure.

WHY ROTOCURE ELIMINATES THIS CAUSE OF FAILURE

As the accompanying diagram shows, BWH ROTOCURED CONVEYOR BELTS are made by a continuous, endless curing process. Weak segments due to overlapping can't *happen* because the belt is in constant, uniform motion.

WHY ROTOCURE PAYS OFF IN DOLLARS AND CENTS

Inherent in the Rotocure process are these 4 specific advantages:

(1) Increased belt flex life — as much as 40%.
(2) Elimination of mechanical distortion at the press ends.
(3) Constant, uniform stretch.
(4) Uniform, abrasion-resistant covers.

These advantages are giving BWH Conveyor Belt users longer life per belt, lower belt maintenance costs and worthwhile savings per ton in materials conveyed. Ask your BWH distributor or write us direct.**

**It will pay you also to get the facts on BWH Rotocured Transmission Belts which permit operation at lower tensions.

*Overcured Sections — present every 30′ to 40′ in all belts made by the flat press method. Only Rotocuring (continuous, non-stop curing) eliminates this major cause of belt failure.

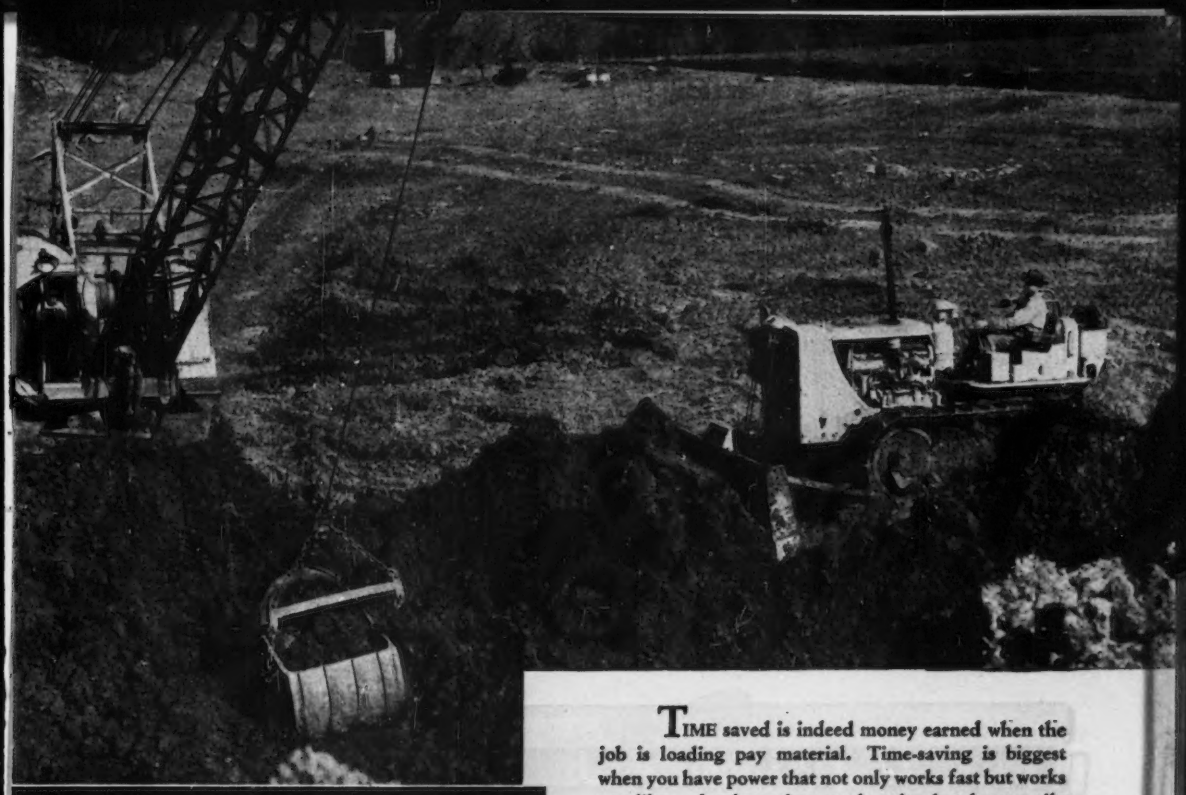
Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P.O. BOX 1071, BOSTON 3, MASS., U.S.A.
WAREHOUSE STOCK: 111 NORTH CANAL ST., CHICAGO, ILLINOIS

BWH
DEPENDABLE RUGGEDNESS



Team for fast loading

TIME saved is indeed money earned when the job is loading pay material. Time-saving is biggest when you have power that not only works fast but works steadily . . . for down-time, on the other hand, can easily turn savings into losses. The loss doubles when the job requires a team of interdependent machines — for when one goes down the other becomes inactive too.

The Federal Chemical Company (Tennessee) minimizes such happenings by using dependable power: "Caterpillar" Diesel. For loading phosphate rock from a 2-acre storage pile onto railroad cars (see picture), a "Caterpillar" D7 Tractor 'dozes the material to a dragline powered with a "Cat" D13000 Engine. An average of 112 ton-yards keeps piling into 50-ton railroad hopper cars per hour. Outstanding operating advantages, according to Federal's Tom S. Miller, are speed and very little down-time. " 'Caterpillar'-powered equipment," he adds, "fills the bill best for us under the trying conditions of phosphate mining."

Leading manufacturers of all types of mining and excavating equipment have engineered their machines to be powered by "Caterpillar" Diesels. You can standardize on power by specifying "Caterpillar" Engines on your machinery purchase order.

Today the importance of "Caterpillar" products, both for military use and for maintaining the national economy, is greatly increased. Talk over your machinery requirements with your "Caterpillar" dealer. He has ample parts stocks to keep your present equipment doing its job and will do his utmost to make prompt delivery of new machines.

CATERPILLAR, PEORIA, ILLINOIS

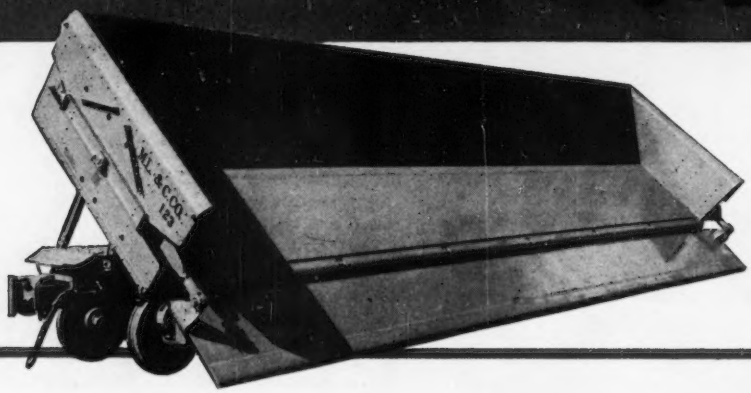
LOOK UNDER THE HIDE

Connecting rods for "Caterpillar" Diesels are made of medium carbon steel, drop forged and heat treated. Of "H" section design, they are rifle drilled to provide oil passage to the piston pin, and to oil-cool the piston. Connecting rods are balanced to close limits. Crankpin bearings are solid aluminum alloy, precision type. Piston-pin bushings are bronze and are precision bored. Look under the hide for built-in quality.

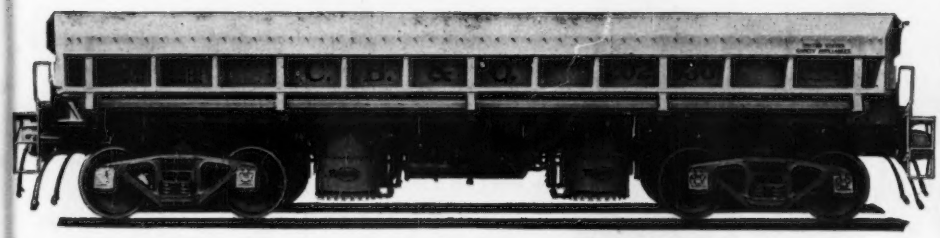
CATERPILLAR

DIESEL ENGINES · TRACTORS · MOTOR GRADERS
EARTHMOVING EQUIPMENT

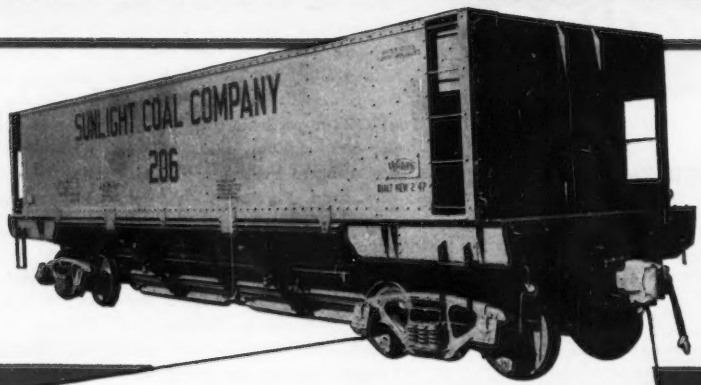
WE'VE MOVED TO



50 cu. yd., 70-ton capacity, alloy steel, dual-side-pivot, drop-door, automatic air dump car. Capacities up to 60 cu. yd., 100-tons. Plain or roller bearing trucks.



30 cu. yd., 50-ton capacity railroad-type, dual-side-pivot, drop-door, automatic air dump car.



87.5 cu. yd., 70-ton capacity hopper car with automatic air-operated, clam shell doors for immediate bottom discharge of material between rails.

Change your records of our address from Aurora, Illinois, to Eddystone, Philadelphia 42, Pa., where we now solicit your inquiries on dump cars, tunnel cars, hopper cars, mine and industrial cars and cars for special purposes.

BALDWIN-

Even in the big Austin-Western plant at Aurora, Illinois, our facilities in recent years have been inadequate to meet your demands for Western Dump Cars. So we've transferred our entire operations—lock, stock and barrel—to Eddystone, Pa., to combine Western's engineering skill, manufacturing know-how and equipment with those of Baldwin-Lima-Hamilton. In the future, as in the past, you'll find Western Dump Cars are engineered to give you the lowest cost per ton-mile for handling ores, coal, sand, gravel, dirt, over-burden, stone, riprap, hot slag and steel mill refuse, railroad maintenance of way and construction work.

Western DUMP CARS

There's a *good* reason why Western Dump Cars are the most popular in dozens of materials-handling fields—an engineering skill that's firmly grounded on over seventy years experience in producing cars specifically "tailored" to each haulage problem.

In Western Dump Cars, you'll find the streamlined strength—without any sacrifice of ruggedness—that gives you the most favorable ratio of deadweight to profitable payload. And, on Western drop-door, air dump cars, the steep angle of dump, extra-fast action, dual-pivoting that reduces dumping time and results in more trips each day. While Western Hopper Cars —have the full-length, full-width, air-operated, *completely unobstructed* bottom discharge opening that speeds unloading at the hopper.

To learn more about the many other features of Western Dump Cars—to see how they are "tailored" to fit specific materials-handling problems—our engineers are always available to meet with you.

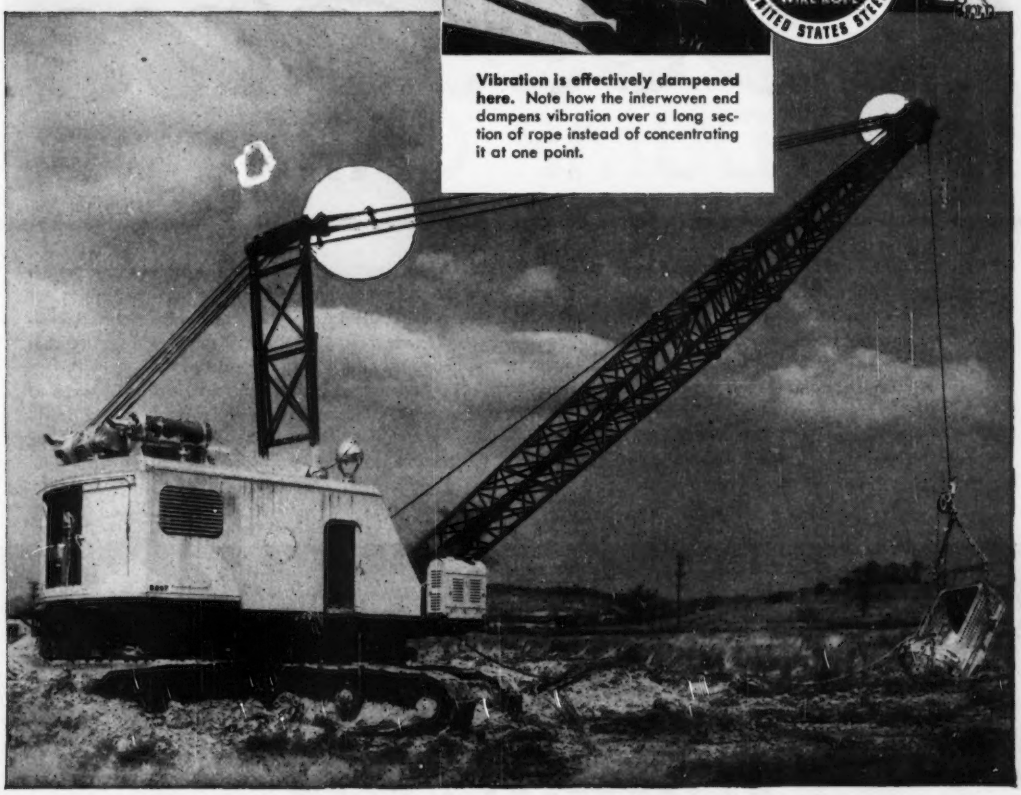
BALDWIN
BLH
LIMA-HAMILTON

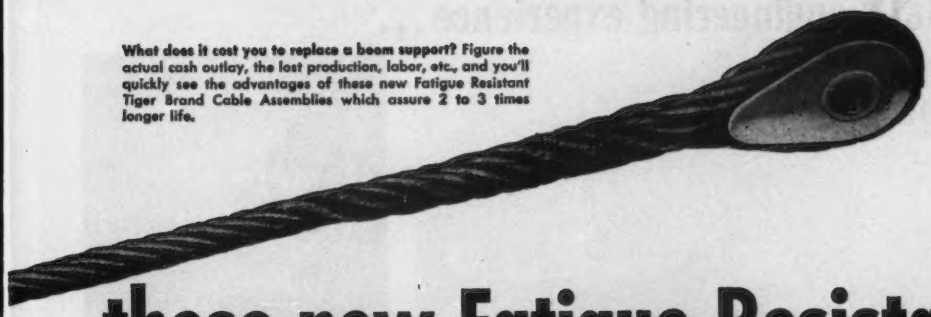
BALDWIN-LIMA-HAMILTON CORPORATION
General Offices: Philadelphia 42, Pa.

LIMA-HAMILTON

Your boom support costs can be cut in half with

Vibration is effectively dampened here. Note how the interwoven end dampens vibration over a long section of rope instead of concentrating it at one point.





What does it cost you to replace a boom support? Figure the actual cash outlay, the lost production, labor, etc., and you'll quickly see the advantages of these new Fatigue Resistant Tiger Brand Cable Assemblies which assure 2 to 3 times longer life.

these new Fatigue Resistant TIGER BRAND Cable Assemblies

***An exclusive development of* AMERICAN STEEL & WIRE COMPANY**

Why these boom supports last 2 to 3 times longer. Excessive vibration is the chief cause of boom support failure. In old style boom supports, vibration is concentrated at the *point* where the rope enters the socket. This causes the wires to break from fatigue. In this new assembly, the effects of vibration are dissipated over a long section instead of being concentrated at one point. The result is two to three times longer life for boom supports and much greater safety.

The new Tiger Brand Assembly has a novel design which embodies *interwoven* eye-end and open-end thimbles which makes these pendants easily and quickly interchangeable on standard equipment.

You also save replacement time. If the machine is down for two or three hours while new boom supports are being installed, you lose that much production time. Longer life from our new supports *results* in fewer replacements. This means clear profit if you use the new Tiger Brand Supports.

Order your next boom supports now. The new Fatigue Resistant Boom Supports can be easily and quickly adapted to your present equipment because essential dimensions such as pin diameters, distances between ears, etc. are the same as for standard open and closed sockets. Send the coupon for complete information.

AMERICAN STEEL & WIRE COMPANY,
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM,
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

American Steel & Wire Company
Rockefeller Building, Dept. C-12
Cleveland 13, Ohio

Please send me complete information on your new Tiger Brand Boom Support Assemblies.

Name.....

Title.....

Company.....

Address.....

City.....State.....

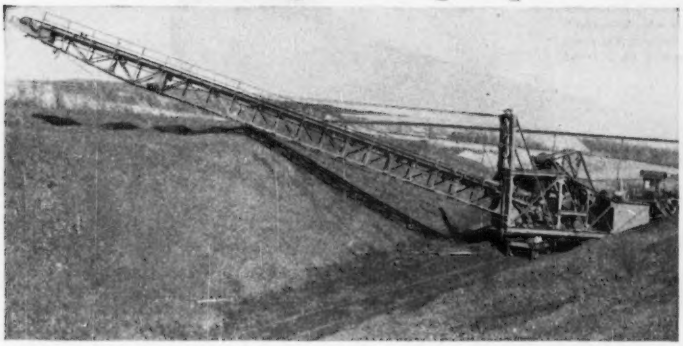
USS

AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

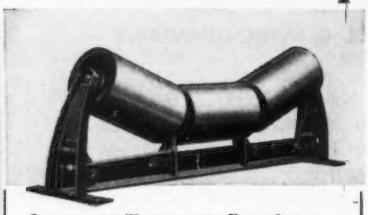
LINK-BELT engineering experience...



Link-Belt belt conveyor system with 100-foot radius traveling stacker and 500-foot trailing section, for stockpiling minus 1½-inch washed iron ore at 400 tons per hour.

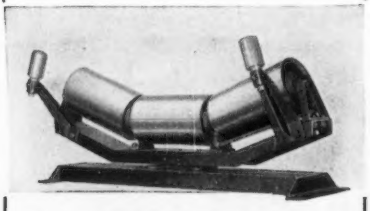
Belt conveyor collecting ore concentrate from rotary table feeders.

Plus LINK-BELT quality components...



SERIES 100 TROUGHED BELT IDLERS. Strong, balanced integral rolls revolve on high-grade roller bearings, Grease-in, dirt-out seal, large reservoir preserve lubricant.

RUBBER-TREAD IMPACT IDLER for loading points protects the belt by absorbing the shock of heavy materials or lumps delivered from above.



BELT-TRAINING IDLER. for automatic belt positioning. The actuating rolls respond to slightest contact — quickly recede and center the belt to minimize wear.

...add up to your best bet in

BELT CONVEYORS

WHAT'S your materials handling problem? Tonnage, distance or a combination of the two? Heavy or light materials? Large lumps or fines? Continuous or intermittent operation?

Whatever the conditions, you'll find the right answers at Link-Belt. For Link-Belt designs conveyor systems to meet your requirements. Backed by unmatched materials handling and power transmission experience, our conveyor specialists help you and your consultants get the right equipment in the right place.

One Source—One Responsibility

Link-Belt makes all the various elements — all types and sizes of idlers, takeups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers.

And Link-Belt will build your supporting structures and enclosures . . . install the job completely. One source — one responsibility. Every detail receives the proper attention to assure you an efficient, trouble-free, long-life conveying system.

The next time you need belt conveyor engineering assistance, call the Link-Belt specialist in our office near you.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,360-A

It's a Fact!

JOY AXIVANE® MINE BLOWERS

produce more air per horsepower

You don't have to make complicated tests to check the efficiency of Joy blowers. Just compare the performance data listed in Joy Bulletin No. J-607 with the published performance data of conventional mine blowers. That will give you positive proof that the mechanical efficiency of Joy blowers is unexcelled for high or low pressure operations.

Moreover, the pressure range in which AXIVANE blowers operate with unequalled efficiency is so wide that it is totally unnecessary to have one type of blower for short lengths of tubing and another type for longer lengths. The Joy AXIVANE mine blower will operate through any length of tubing with high efficiency.

Five sizes, ranging from ½ to 5 H.P., make up the series. For greater duties, AXIVANE fans from 5 to 3000 H.P. are available.

● *For complete data, write for Bulletin J-607.*

AERODYNAMIC DESIGN

The blades of Joy blowers are of airfoil shape, similar in cross-section to an airplane wing. Rotors are of cast-aluminum construction, permitting accurate adherence to the design shape. Both the number and shape of the blades and stationary vanes are mathematically determined to insure greatest efficiency. The minute clearance between blade-tip and blower casing eliminates most tip loss, a common cause of fan inefficiency and noisy operation.

VANEAXIAL CONSTRUCTION

Joy blowers have stationary vanes to recover the rotative energy imparted to the air by the rotor. The airflow from AXIVANE blowers is therefore substantially axial. The unequalized outlet pressures of all other fan types create non-axial, turbulent airflow, which is wasteful of power. Joy blowers consequently give you a more favorable electric-to-air-power ratio, and are relatively quiet in operation.

Consult a Joy Engineer

W&O CL 3752

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

B.F.Goodrich

Tire cut-resistance proved on steel slag road bed

THE 30-ton mobile crane pictured above is one of 20 vehicles used by a salvage operator in the heart of the Gary, Indiana steel mill area. The tires that carry these vehicles roll over the toughest kind of road beds . . . razor-sharp slag, a bed of jagged edges. A bulldozer slices the top off a slag pile—and that's the road. Here dump trucks, bulldozers and truck-mounted cranes are in service in all kinds of weather.

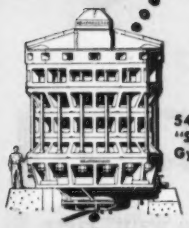
These trucks, however, are 100% B. F. Goodrich equipped and there has not been one single road delay caused by tire trouble since these BFG's have been in service.

B. F. Goodrich tires were selected for use because of their superior cut and bruise resistance. The operator has found that the special tread compounds used in B. F. Goodrich tires and the unique tread design of B. F. Goodrich Universals keep cutting to an absolute minimum. These tires have greater bruise resistance because they are made with the patented B. F. Goodrich *nylon shock shield.* Strong, elastic layers of nylon are built in between the tread rubber and the cord body. Under strong impact, these nylon cords stretch and work together to absorb and distribute the shock evenly. This special feature is found in *all* BFG tires of 8 or more plies at no additional cost.

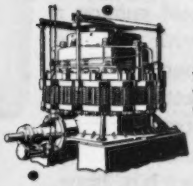
No matter what kind of off-the-road service you demand, there's a special B. F. Goodrich tire to fill your needs. Let your local dealer help you get better service and lower operating overhead. *The B. F. Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER

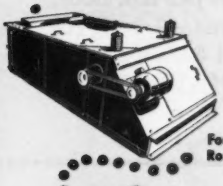
Another Prominent Mining Company Selects NORDBERG *throughout!*



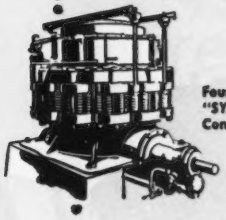
54" super-heavy "SYMONS" Primary Gyratory Crusher.



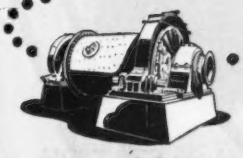
Two 7-foot super-heavy "SYMONS" Standard Cone Crushers.



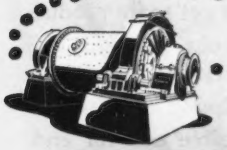
Four 5' x 8' "SYMONS" Rod Deck Screens.



Four 7-foot super-heavy "SYMONS" Short Head Cone Crushers.



Two 10'8" x 17'0" Nordberg (Primary) wet grinding Mills.



Two 10'8" x 17'0" Nordberg (Secondary) wet grinding Mills.

TOTALLY destroyed during World War II, the Sydvaranger iron ore crushing and concentrating plant at Kirkenes, Norway, far above the Arctic Circle, one of the world's outstanding pioneer *taconite* operations, is being reconstructed.

Nordberg-built machinery has been selected for all stages of Crushing, Screening and Grinding. The ore is an extremely hard, laminated magnetite, quite similar to the American magnetic *taconites* of the Lake Superior district.

Nordberg supplied the Sydvaranger Company with a *"SYMONS"* extra heavy duty 54" gyratory for primary breaking ... the strongest gyratory of this size ever built.

The world renowned *"SYMONS"* CONE CRUSHERS, which had been used by Sydvaranger in their former operations, have again been chosen for secondary and tertiary crushing. These are all of Superheavy 7-ft. size in Standard and Short Head types. *"SYMONS"* Rod Deck Screens are being installed for scalping service.

To obtain a high grade of concentrate, very fine grinding is necessary, and in addition to the *"SYMONS"* Primary, Secondary and Third Stage Crushing Units, Nordberg Heavy Duty Primary and Secondary Ball Mills, 10' 8" dia. x 17 0" long, are being installed.

Wherever mining is done, you'll always find Nordberg machinery the first choice of experienced operators. Nordberg Mining and Milling machinery to meet *your* requirements includes Mine Hoists; *"SYMONS"* Gyratory Crushers for primary crushing; *"SYMONS"* Cone Crushers for second and third stage crushing; *"SYMONS"* Vibrating Bar Grizzlies; *"SYMONS"* Rod Deck and Horizontal Vibrating Screens for sizing; a complete line of Ball, Tube and Rod Grinding Mills; and a complete line of Nordberg Diesels for dependable, low cost power production.

Write for literature on the equipment you need.

NORDBERG MFG. CO.
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"SYMONS"... a Nordberg trade mark known throughout the world

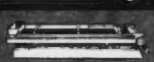
M551-R

NORDBERG

Machinery for processing ores and industrial minerals

"SYMONS" PRIMARY CRUSHERS

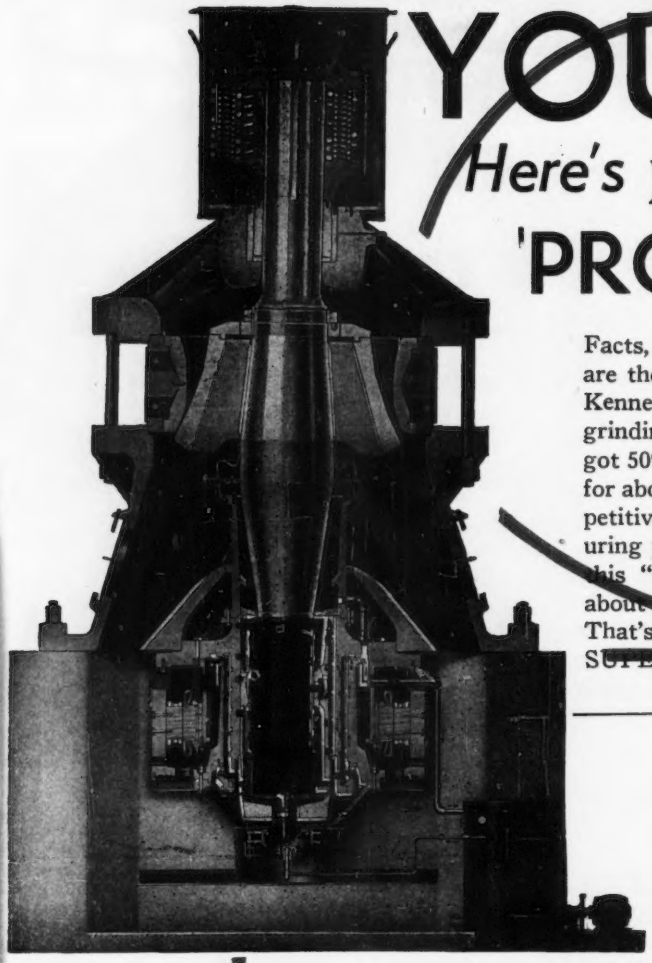
"SYMONS" CONE CRUSHERS



"SYMONS" VIBRATING SCREENS and GRIZZLIES

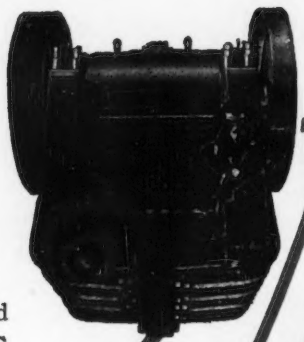
GRINDING MILLS

DIESEL ENGINES



YOU'RE IN
Here's your
'PRODUCTION

Facts, not talk, are what you want! Here are the FACT results of a test run on a Kennedy No. 37½ Crusher with a special grinding ring and 3" feed opening. They got 50% MORE of a finer, better product for about HALF the power cost of a competitive crusher of comparable size. Figuring power cost at 1 cent per h.p. hour, this "KVS" SAVED some 40 h.p. (or about $11 a day) or about $3,000 a year! That's not luck — THAT'S "KVS" SUPERIORITY!



Here's LONGER LIFE

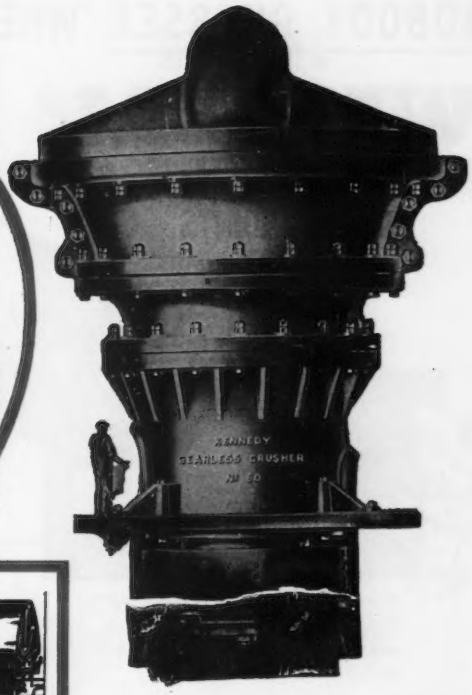
Is it LUCK because there's less wasted power and effort in the "KVS" SWING JAW CRUSHER? No — it's because we redesigned the STATIONARY jaw to carry 50% of the crushing load. You get more production and get it more efficiently. We took LUCK out of MAINTENANCE too. The swing jaw is ALL IN ONE PIECE, except for the crushing plate. That's removable. Note also—Swing and Stationary jaws are INTERCHANGEABLE, and reversible end for end. That DOUBLES jaw-crushing life for you lucky "KVS" users!

IT'S YOUR LUCKY DAY WHEN

LUCK!!!

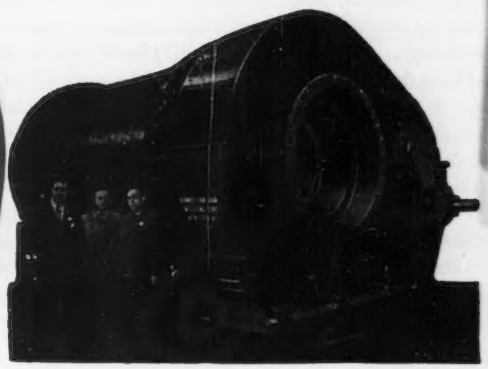
Here's your POWER!

You're out of luck if you haven't enough POWER to run a big CRUSHER. But when you use a "KVS" Gearless you get ADDED FREE POWER for no added cost! That's the extra power that results when a big pulley or fly wheel whirls around—like the big pulley on the old Corliss Engine. There's a BIG Pulley in the "KVS" Gearless! It whirls at 3,500 ft. per minute—and the EXTRA crushing energy or crushing power you get isn't "luck"—it's "KVS" superior design. The 8-ton pulley (used in a "KVS" Crusher weighing 400,000 lbs.) whirls so easy you can turn it with TWO FINGERS! In short, more CRUSHING for LESS POWER COST makes "KVS" lucky for users everywhere.



Here's $5,000 for you!

You'd be lucky if you found $5,000—and could keep it! But don't trust to "luck"—take the SURE way and save that $5,000 on a 10 ft. tube or ball mill. How? Suppose you buy a "KVS" with integral gear drive. The Kennedy INTEGRAL GEAR DRIVE enables motor to be DIRECT CONNECTED to driving shaft. ON A 10 FT. MILL THIS ENABLES YOU TO PURCHASE THE SYNCHRONOUS MOTOR AT A SAVING OF ABOUT $5,000. Shaft is carried in roller bearings that CANNOT be misaligned or set wrong. Pinion shaft to which the motor is connected runs at 600 r.p.m.; other pinion shafts run about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills are CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically sprayed with oil before tube mill is started (Design patented). And they never wear out!



WRITE today for complete set of "KVS" Bulletins if you want MORE production with LESS cost

Kennedy-Van Saun
MANUFACTURING AND ENGINEERING CORPORATION

YOU BUY "KVS"

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DANVILLE, PA., U.S.A.
CANADA, ENGLAND, FRANCE, ITALY, AUSTRALIA

NOBODY GUESSES WHEN YOU USE . . .

WALSEAL*

FOR MAKING SILBRAZ* JOINTS

Cutaway view of a Walseal Tee showing: 1—factory-inserted ring of silver brazing alloy; 2—fillet of silver brazing alloy that appears upon completion of Silbraz joint; 3—cutaway view of the completed Silbraz joint showing that silver brazing alloy has flowed in both directions from the factory inserted ring.

When you see this fillet of alloy, and the fitting is Walseal you know that you have penetration because the alloy comes from the inside.

When you make Silbraz* joints in your brass, copper, or copper-nickel pipe lines with Walseal Valves, Fittings, or Flanges you know you have the right amount of the correct type of silver brazing alloy. The ring of Sil-Fos brazing alloy is factory-inserted in the ports of Walseal products at the time of manufacture.

No lost time or motion in handling the alloy . . . no difficulty in getting full penetration of the alloy regardless of the position of the valve or fitting . . . no guessing whether the joint is made right . . . the fillet of alloy that shows up when the Silbraz joint is completed, comes from the inside!! And, whether you've made the Silbraz joint yourself, or inspecting the work of another, you know that if the silver alloy fillet is visible, and the valve or fitting is Walseal, you have full penetration. That's why nobody guesses when you use Walseal!

Walseal products are backed by the reputation of the Walworth Company, manufacturers of valves and pipe fittings since 1842.

For full information regarding Silbraz joints made with Walseal products, write for Circular 84.

*Patented—Reg. U. S. Pat. Off.

Recommended for

- Hot and Cold Water Circulating Systems
- Boiler Feed Lines
- Steam Return Lines
- Condensate Lines
- Low and High Pressure Air Systems
- Lubricating Oil Circulating Systems
- Industrial Gas Piping
- Solvent and Vacuum Piping Systems

Make it "a one-piece pipe line" with WALSEAL

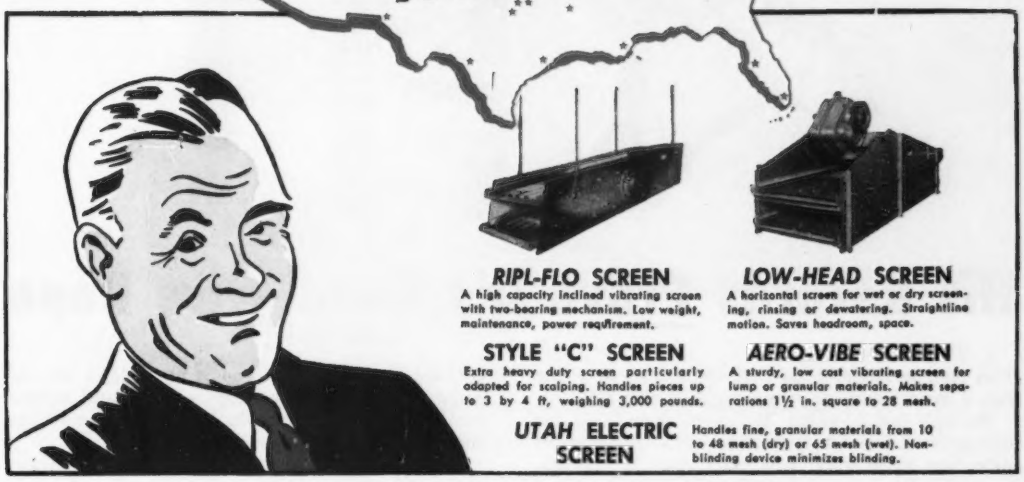
WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Want Help WITH SCREENING?



RIPL-FLO SCREEN
A high capacity inclined vibrating screen with two-bearing mechanism. Low weight, maintenance, power requirement.

LOW-HEAD SCREEN
A horizontal screen for wet or dry screening, rinsing or dewatering. Straightline motion. Saves headroom, space.

STYLE "C" SCREEN
Extra heavy duty screen particularly adapted for scalping. Handles pieces up to 3 by 4 ft, weighing 3,000 pounds.

AERO-VIBE SCREEN
A sturdy, low cost vibrating screen for lump or granular materials. Makes separations 1½ in. square to 28 mesh.

UTAH ELECTRIC SCREEN
Handles fine, granular materials from 10 to 48 mesh (dry) or 65 mesh (wet). Non-blinding device minimizes blinding.

ALLIS-CHALMERS district offices offer you the services of experienced vibrating screen engineers. In all mining areas are specialists who have the training and experience to help you get top screening performance and lowest screening costs for your job.

These experts will come into your plant, look over your present equipment, and suggest how your screening can be made a more profitable operation. Their recommendations are unbiased because Allis-Chalmers builds *all* types of vibrating screens . . . for *any* screening application. All Allis-Chalmers screens can be obtained complete with motor, drive and control.

Feel free to call on Allis-Chalmers for real help in solving screening problems. You'll be getting the finest engineering and experience available anywhere. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3450

Pulverator, Low-Head, Ripl-Flo, Aero-Vibe and Utah are Allis-Chalmers trademarks.

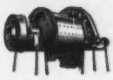
ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Pulverators

Vibrating Screens

Jaw Crushers


Grinding Mills

Gyratory Crushers

Kilns, Coolers, Dryers

His Records Prove It's Good Wire Rope

This man knows that his Bethlehem rope is giving him a good return on every dollar it cost him.

He isn't just guessing. He keeps records on the doings of all his wire ropes; figures that tell him the date they go to work, how much they accomplish, and when they're replaced. From his figures he can see which brand is *doing the most* for him over a period of time. He doesn't rely on general impressions or rough estimates. He *knows!*

Bethlehem urges that all users of wire rope do likewise—keep records of wire rope performance, expressed in units of work. How many ton-miles a rope accounts for; how many yards of rock it moves, how many cars of coal it hauls up a slope, etc. By doing so, the user can compare one brand against another; see for himself which brand is costing him the *least* for the actual work it does.

We know that in any such comparisons, Bethlehem wire rope will prove an outstanding value. Stack it against the field; keep your own figures. They'll tell you, in black and white, that a dollar invested in Bethlehem rope buys a mighty big dollar's worth of service.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

LET YOUR RECORDS TELL YOU!

Profits keep coming in when pay loads keep moving out

Choose

MANCHA

Storage Battery Locomotives

They're built to keep going

This Mancha is working in an isolated Canadian gold mine. It has been on the job steadily for the past twelve years.

In isolated locations, where transportation of equipment to and from the mine is difficult and expensive, locomotive breakdowns are especially serious—*trouble-free operation* of prime importance. That's why, in mines hard to reach, you see so many Mancha locomotives on the job. MINE MANAGEMENT AROUND THE WORLD COUNTS ON MANCHA FOR THE *UNINTERRUPTED PERFORMANCE* THAT SPELLS PROFIT.

Will a Mancha Storage Battery Locomotive pay in your mine?

Whether or not you are in the market for new haulage equipment—

YOU CAN HAVE THE ANSWER NOW!

Simply ask for a "data record form." Fill it in and mail it back to us.

The data will enable us to tell you if Mancha locomotives can be profitable for you.

Mail the coupon today, and have valuable haulage information for consideration now, and in the future.

Mancha Storage Battery Locomotive
Division **GOODMAN** *Manufacturing Company*
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ-1251
Send your "data record sheet."

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FIRM _____

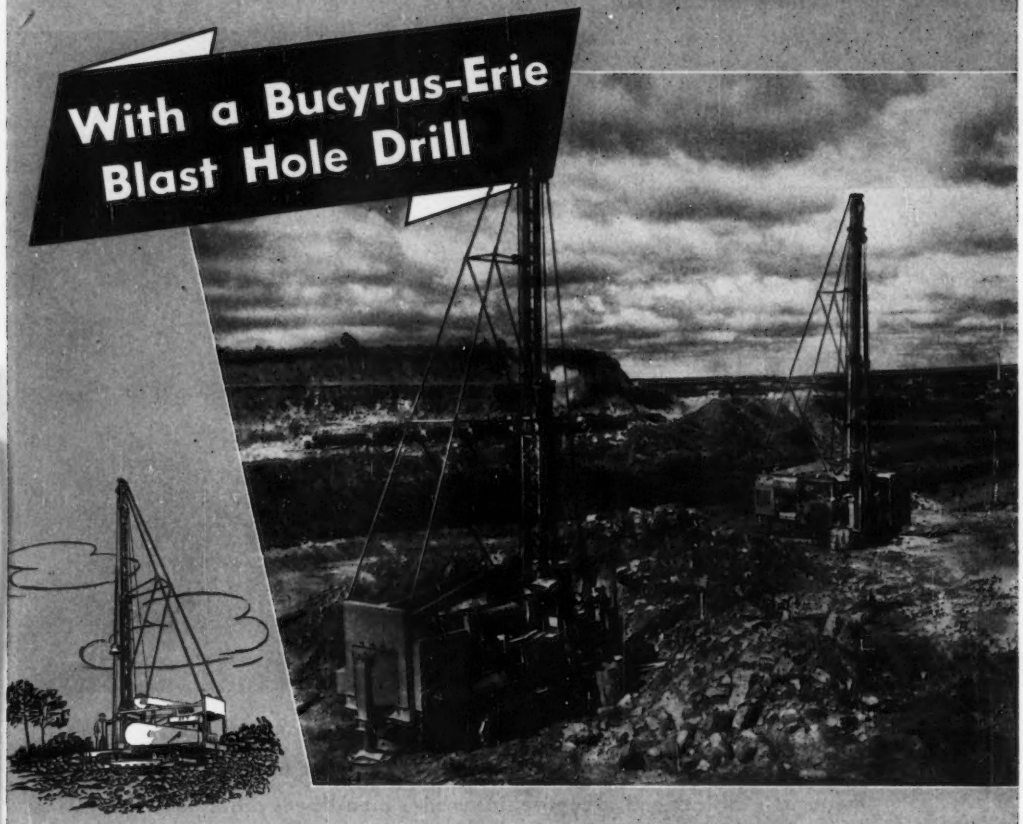
ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

Trim Your MAINTENANCE EXPENSES

With a Bucyrus-Erie Blast Hole Drill



IF high maintenance and upkeep expenses have been adding to your blast hole drilling costs, it will pay you to investigate the Bucyrus-Erie line of blast hole drills. All-steel welded construction throughout is one reason why Bucyrus-Eries keep maintenance costs down. Others are:

STRUCTURAL STEEL FRAME locks the drilling machinery in accurate alignment, allowing the use of close-fitting parts which result in smooth performance with the least wear and maintenance costs.

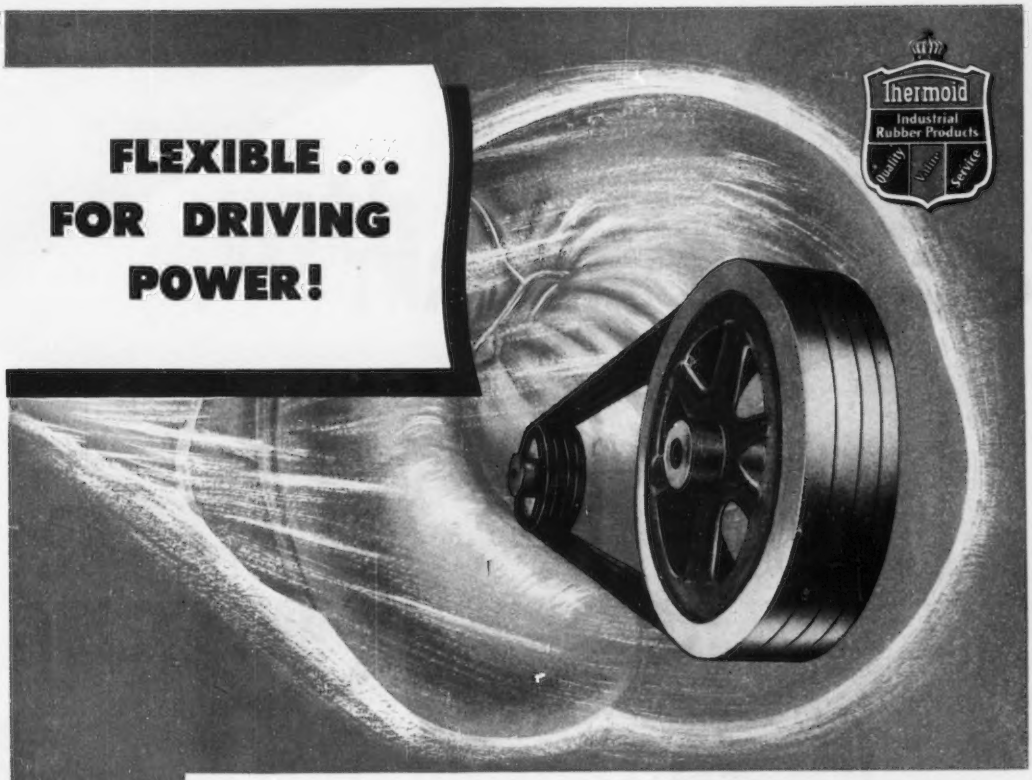
RUBBER SHOCK ABSORBER in derrick head and rubber-insulated spudding beam and heel sheaves combine to absorb the vibrations, oscillations, and shocks of drilling. The result is longer machine life and reduced repair costs.

ANTI-FRICTION BEARINGS for jackshaft keep power flowing smoothly, reducing wear on pinions and gears.

Add these efficiency features to Bucyrus-Erie's super-shattering drill action, easy control and tractor-like mobility and you'll find Bucyrus-Erie blast hole drills are the most dependable, most productive rigs in the field. Write today for full information on our complete line — four models — hole capacities from 5⅝ to 12-in.

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



Thermoid Multi-V Belts are pre-stretched . . .

they're flexible to insure maximum power transmission without adjustment. They are backed by over 70 years of engineering know-how . . . constructed to absorb repeated shock loads . . . thoroughly impregnated with special rubber compounds to withstand moisture and abrasion, resulting in longer belt life.

Thermoid Multi-V Belts are available in matched sets . . . uniform in size and cross section. Their longer life and non-slip performance add up to "Power . . . at the lowest cost per hour."

Your Thermoid Distributor can help you with your power belting problems . . . whether you need Multi-V, F.H.P. or flat transmission belts. For unusual belt problems, a Thermoid Field Representative is always available to give you the benefit of his experience.

Thermoid

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose
Rubber Sheet Packing • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company Offices & Factories: Trenton, N. J., Nephi, Utah

BRILLIANT

UNFAILING

DEPENDABLE

MSA

SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service.
Our job is to help you.

with The New EDISON

ILLUMINATION R-4

Electric Cap Lamp

Its brilliant beam illuminates every detail of the job, promotes greater tonnage output and improved safety. Its design and construction keep it on the job, shift-after-shift, for years. Miners equipped with the new Edison R-4 Electric Cap Lamp have the added confidence that goes with knowing the beam of light they depend on for safety and production will not fail.

Stepped up in intensity to meet the increasing needs of mechanization, the R-4 fills your lighting needs today, with an extra margin of performance to meet any expanded requirements of tomorrow.

You'll find it profitable to investigate this vital mining tool. Write for Bulletin No. M-19.

MINE SAFETY APPLIANCES COMPANY

Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

At your Service: 67 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA LIMITED

Toronto, Montreal, Calgary, Winnipeg, Vancouver, New Glasgow, N.S.

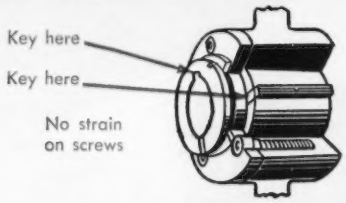
Cable Address: "Minsaf" Pittsburgh

ONE PIECE MOUNTING—Bushing and sheave go on together. Alignment is easy. Sheave is on right first time.

TEXROPE
Greatest Name in V-Belt Drives

This... Not This!

FULL CIRCLE GRIP — Bushing split full length. Collar is separate. Shaft gripped full length around full diameter.



POSITIVE DRIVE — Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings.

USE FAST-MOUNTING Magic-Grip SHEAVES

Full Grip...No Slip!

MAGIC-GRIP SHEAVE is the fastest mounting sheave you can buy. And you can demount it just as fast. It runs true, will not slip or jam. It always comes off easily without hammering, forcing, or distortion.

Best of all it costs no more than an ordinary sheave. Even if you don't change sheaves often, you should have *Magic-Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off. Sizes 1 to 250 hp.

WIDEST V-BELT LINE

You can get everything you need for your V-belt drives from one reliable source. Allis-Chalmers offers the broadest line of V-belts, speed changers, and standard and variable speed sheaves in the industry. And you get the extra engineering skill that comes from having more industrial V-belts, installations than any other manufacturer.

Get the 120 page *Texrope* Pre-Engineered Drive Manual 6956 from your A-C Authorized Dealer or Sales Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

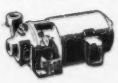
A-3240

Sold... Applied... Serviced...

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.



PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and *Magic-Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS A-C

Extra-Tough!

...more original miles—more recaps!

America's specialized truck operators report: "First tire we ever had with a carcass strong enough to master the toughest combination on-and-off-the-road work." The new U. S. Royal Fleetmaster is *job-fitted* to your exact requirements—*gripping penetration* and *traction off the road* when you need it; *smooth-rolling, non-skid mileage on the highway* when you want it!

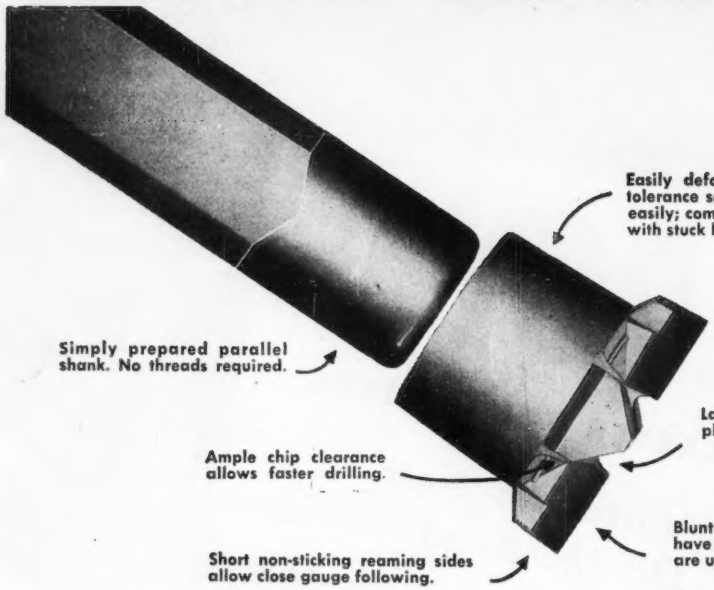
Here's What Does It:

- ★ *70% deeper traction tread!*
- ★ *Tougher, stronger carcass! (More Recaps)*
- ★ *Job-Fitted tread compounds!*
- ★ *Thicker under-tread!*
- ★ *Round-molded to the tire's inflated shape to reduce distortion stress and strain!*

You can get all the facts about the new Fleetmaster from your nearest U. S. Royal Dealer. **A phone call does it!** He's listed in the Classified Telephone Book.

UNITED STATES RUBBER COMPANY

THROWAWAY


Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency — are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

LOWER YOUR DRILLING COSTS
with
SMALLER HOLES AND FASTER DRILLING

Bottom with 1¼″ Hole

Save Powder and Steel

WRITE FOR NEW LOW PRICE LIST

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Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.

On the TOUGH Jobs Operators know

JALLOY HEAT-TREATED PLATES

J&L STEEL

. . . resist impact, abrasion and corrosion

. . . provide longer service life, lower maintenance costs

Cost-conscious mine operators throughout the industry are cutting maintenance and downtime costs by installing tough J&L Jalloy heat-treated steel plates on their equipment.

They've found that on the tough applications heat-treated Jalloy lasts 4 to 20 times longer than mild steel. The reason—Jalloy has the physical properties to resist the severe impact, abrasion and corrosion of mining operations. It is produced with a yield strength of 160,000 lbs. per sq. in. and a Brinell hardness of 341 to 388. The result—Jalloy saves money by cutting steel requirements, reducing downtime for repairs and replacement, and keeping labor costs for maintenance to a minimum.

Here are some of the applications where mine operators are using heat-treated Jalloy—Dump Truck Bottom Liners, Coal, Rock and Ore Chute Liners, Dipper Stick, Shovel and Drag Bucket Reinforcing. You can get Jalloy in bar form and in plates up to 72″ wide and 20′ long with thicknesses from $\frac{3}{16}$″ to $1\frac{1}{2}$″.

Start finding out more about Jalloy today. Just write to Jones & Laughlin Steel Corporation, 412 Jones & Laughlin Building, Pittsburgh 30, Pa. We'll send you a free copy of our booklet, "For Longer Wear . . . Less Repair!" It will give you more complete information on the properties, heat treating and workability of heat-treated Jalloy, the modern mining and quarrying steel.

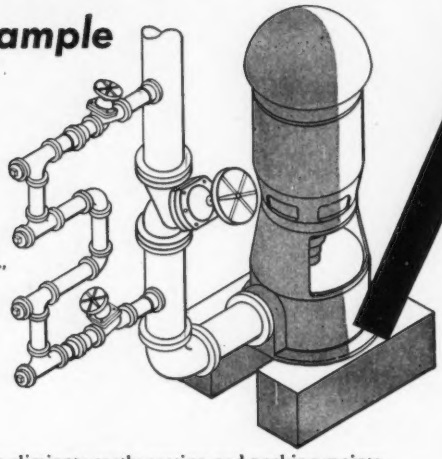
JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PA.

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¾-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . no maintenance whatsoever needed to date!

Another typical demonstration of superior quality, and the low-cost performance of Crane Valves. That's why . . . More CRANE VALVES are used than any other make!

...Choose Dependable CRANE VALVES

No. 1611 Crane Iron Body Diaphragm Valve —one of a full line suited for many services. Literature on request from your Crane Branch or Crane Wholesaler.

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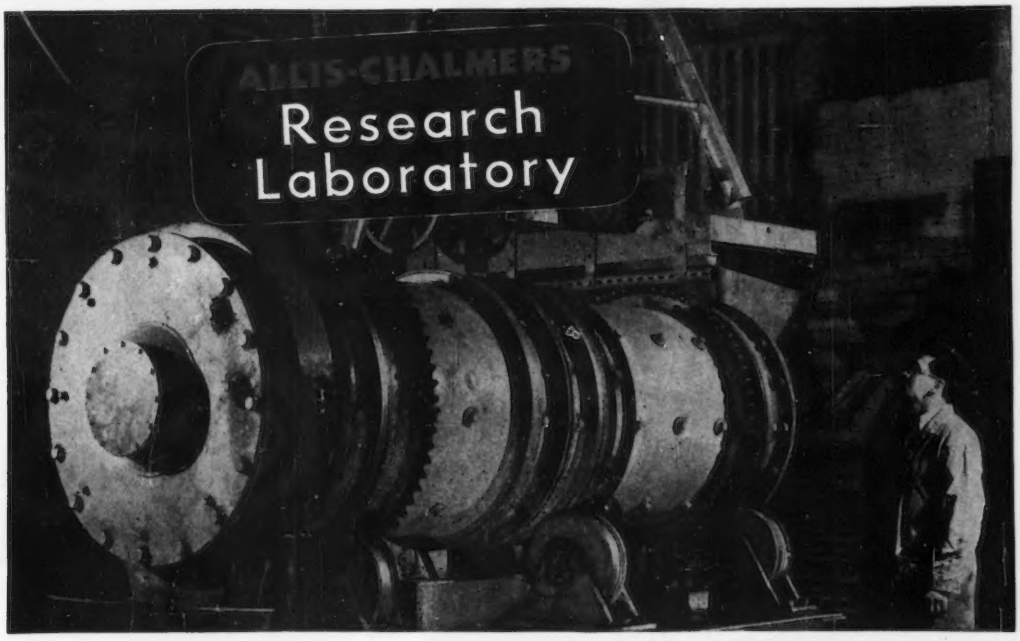
VALVES • FITTINGS • PIPE • PLUMBING • HEATING



How Lab Tests Reduced Initial Plant Cost

A PROCESSOR wanted to find a low cost method of crushing and dry grinding lead slag to a carefully controlled product of 98% passing 10 mesh. A method had been worked out previously which would meet these size specifications but which required a considerable amount of costly auxiliary equipment. The customer hoped that a simpler method might be found.

A 20-ton sample was sent to the Allis-Chalmers Research Laboratories for a pilot plant test run. Proper operating conditions were established, and it was proved that the required reduction could be achieved by open circuit dry grinding in an end peripheral discharge rod mill with no auxiliary equipment.

As a result of the Laboratory tests, this company was able to save money on the original plant investment. Simplified plant layout also resulted in low maintenance.

CAN YOU USE THESE FACILITIES?

The Allis-Chalmers Processing Laboratory was established to help you work out profitable solutions to processing problems. It contains modern equipment for batch and pilot mill tests in grinding, crushing, sizing, concentrating, pyro-processing, chemical and physical analysis.

The Laboratory's purpose is to develop new or more efficient processing methods...to determine the economics of a process prior to full-scale operation . . . to provide engineering information to guide in designing efficient plants . . . for virtually any type of industry.

Facilities of the Laboratory are available to anyone in industry. Charges are based on costs. Estimates for test work can be obtained from A-C district offices or from Allis-Chalmers Processing Laboratory, Milwaukee 1, Wisconsin.

A-3484

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Laboratory Bulletin 07B6419B

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Processing Research Laboratory — Dedicated to a Better Utilization of our Raw Materials

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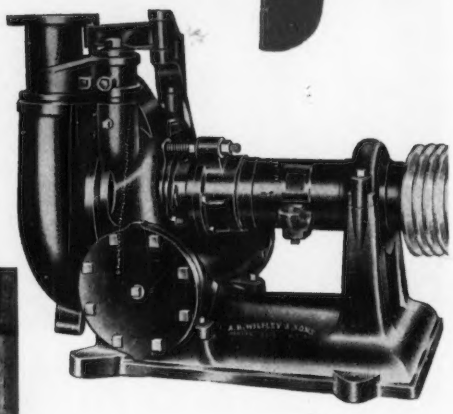
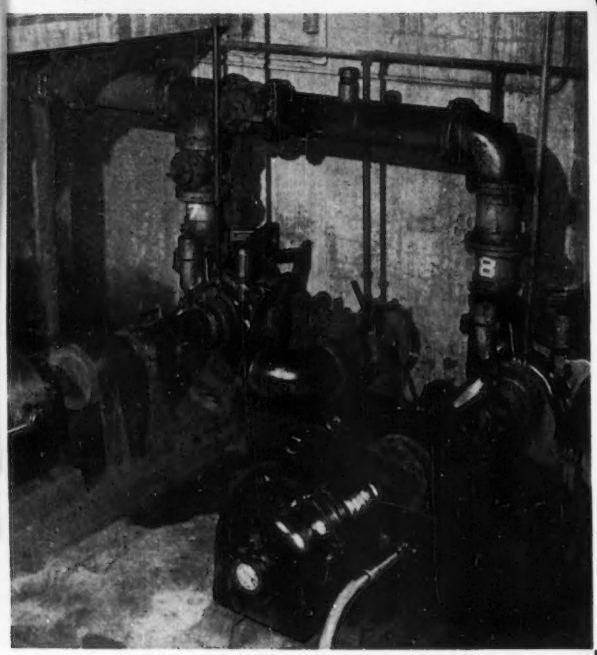
WILFLEY
centrifugal PUMPS





Important mechanical improvements and refinements in the new Model "K" WILFLEY Sand Pumps save power and production dollars—deliver stepped-up 24-hour-a-day performance and low cost operation. These pumps are noted for efficiency and economy in handling sands, slimes, sludges and slurries. Easy interchangeability of wear parts. Low maintenance. Continuous, 24-hour operation without attention. Individual engineering on every application. Write or wire for Model "K" Bulletin 200.

This installation of Model "K" WILFLEY pumps handles middlings in a modern copper mill in Mexico. The pumps operate continuously on a 24-hour, trouble-free schedule. The Model "K" is a companion to the famous WILFLEY Acid Pump.

A. R. WILFLEY & SONS, INC., Denver, Colorado, U.S.A.
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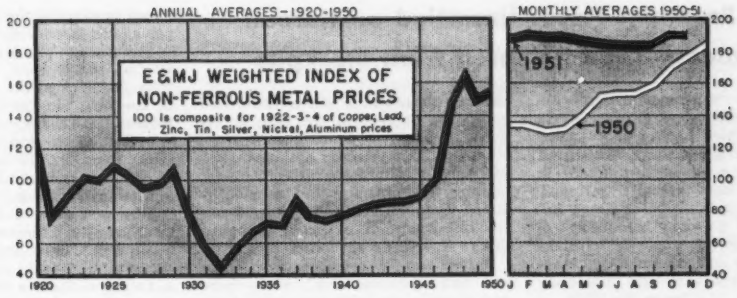
Buy **WILFLEY** *for Cost-Saving Performance*

E&MJ OUTLOOK

PRICES



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MARKETS

Conflicting reports from Korea had traders in world commodities bewildered as November ended. But speculators, operating largely outside the U.S., scented change, and premium prices for various metals were weakening. There's no sign of any easing in the U.S., however.

The *E&MJ* index of nonferrous metal prices eased a fraction for November to 193.17 on a lower average for foreign silver. October's index was 193.21; the 1951 high thus far was February's 194.06.

•

LABOR

The Kennecott settlement for a 15¢ per hour wage increase (plus a 4½¢ pension), might also turn out to be the steel settlement. The Government couldn't allow more and still talk about "stabilization."

Right after the New Year, Mine, Mill will launch an organizing drive to try to recover lost ground in the Tri-State.

•

AT HOME

Although high inventories, consumer resistance to high prices, and the bite of income taxes may produce some rough spots in the economy in the next quarter, mining activity should hold strong through 1952.

Anaconda is patiently waiting out an intra-Government squabble over the company's entry into aluminum. It was Washington's idea, after all, and the chances are that the deal will go through as planned.

The NPA says there may be **no copper or nickel at all** for civilian consumers next year, but we doubt it. Also it's hard to see how zinc can be desperately short much longer when all the new production in sight begins to come in.

We were all to be manning the barricades before stockpiled metal was released, yet the Government is now using it to try to "stabilize" world prices. It may work, but it will make enemies.

•

ABROAD

Nord Africaine du Plomb drove recently through enough high-grade zinc ore near Zellidja in French Morocco to insure repayment of that ECA loan the company got two years ago.

Canadian gold producers are only dipping their toes into the cold waters of the world's free markets. Lake Shore has sold 6,200 oz. at around $38, but only a few more small-lot sales were reported. The markets would have taken about 25,000 oz. without strain.

The RFC's adamant attitude on the tin price is due to soften, close observers believe, perhaps even as far as $1.25.

MARKETS—Trends and Prices

Foreign Premium Prices Unsettled on Korean Developments—Lead Released from Stockpile

ENCOURAGING DEVELOPMENTS in Korea late in November were reflected in increased caution among speculatively inclined traders in commodities. Some premium prices in metals in European centers actually softened. In this country, with "everything under control," primary producers of metals continued to struggle with the extraordinary demands of an expanding defense program and relatively high civilian requirements. Only a general reduction in the defense program could ease the tension in the early months of 1952.

The dock strike in the New York area ended Nov. 9, releasing large tonnages of copper and other strategic materials. Operations at the Herculaneum smelter of St. Joe remained suspended because of the strike for higher wages. The decline in production during the summer months and shrinking imports caused President Truman to issue an order releasing about 30,000 tons of lead from the stockpile.

Price Index Steady

The *E&MJ* price index for November showed little change at 193.17. This compares with 193.21 in October and 186.00 in November last year. The slight dip in November resulted from a lower average price for foreign silver.

Industrial production in October, as measured by the index of the Federal Reserve Board, came to 219% of the 1935-39 average, the same as the revised figure for September. The postwar peak was 223 last April. Production of automobiles and appliances declined.

OPS issued its overdue ceiling price on antimony. Effective Nov. 21, it established a ceiling of 50¢ per lb. on bulk shipments, f.o.b. producer's plant, on minimum 99% but less than 99.8% antimony. On the top grade, 99.8% antimony containing no more than 0.05% arsenic, the ceiling was fixed at 50½¢. For grades containing less than 99% antimony, the ceiling is 49½¢ per lb. of antimony contained. The delivered ceiling price for antimony oxide, carload lots, has been fixed at 48¢.

Quicksilver was unsettled on pressure to move metal that had been tied up in the dock strike. The price declined to $215 per flask, a loss of $3 for the month. Domestic production has been increasing rather slowly because of distrust over the pricing policy of leading European producers.

The Government released stockpile copper to fabricators during October, thereby maintaining a steady flow of metal for defense in the face of reduced production from recent work stoppages. Fabricators obtained 125,286 tons of refined copper in October, making the total for the ten months ended October 1,124,564 tons. Some stockpile metal is expected to figure in the November statistics.

Production of crude primary copper has increased moderately here and abroad (see table page 105). Output of crude copper obtained from secondary material has declined sharply. Controls in this country are largely responsible for the drop in the movement of copper scrap into normal channels of distribution. The fact that the price ceiling here is regarded as too low also tends to distort the picture. With Washington authorities making dire predictions in regard to the supply situation for 1952, generators and collectors of scrap naturally would be in no hurry to clean out their bins. However any easing in the tension would accomplish much in the way of loosening the jam in scrap. The double-pricing standard in primary copper, 24½¢ in this country and 27½¢ abroad, also stands in the way of promoting improved marketing conditions in the scrap division.

Lead Allocations

Allocation of imported pig lead, originally set for Nov. 1, has been postponed to Jan. 1. With the foreign market still substantially higher than in this country, buying of lead abroad by domestic consumers could not be resumed. The growing shortage has made consumers more anxious than ever to obtain lead. Requests for December metal totaled more than 130,000 tons, whereas NPA had only 26,000 tons of domestic lead for allocation.

Acting on Mobilization Director Wilson's request for stockpile lead to relieve the situation, President Truman authorized the withdrawal of 30,000 tons. The stockpile lead will be released by the Munitions Board to the General Services Administration for distribution. As November ended, it appeared to trade authorities that the Government's contribution will be released to needy consumers at the rate of about 10,000 tons a month. After the lead released from the stockpile has been distributed, Washington authorities hope that the foreign price will have weakened and imports can be resumed.

As soon as Congress reconvenes in January, legislation will be introduced to suspend the lead duty for the period of the emergency.

Imports of pig lead in September totaled 10,850 tons, which compares with 26,981 tons in August. Imports in the nine months ended September totaled 129,821 tons, of which Canada supplied 38,125 tons; Mexico, 29,444 tons; Peru, 22,973 tons; Yugoslavia, 23,803 tons; Australia, 10,795 tons; and other countries, 4,681 tons.

Stocks of zinc in the hands of the smelters have increased in recent months to 23,984 tons. This moderate accumulation could be traced in part to technical factors affecting the shipment of toll metal obtained from foreign concentrates. The demand for zinc has not diminished but limitations on use have cut down consumption in some products.

On Jan. 1, NPA will reduce from 20 tons to 10 tons the quantity of slab zinc that can be purchased in any month without an allocation certificate.

The RFC maintained its selling basis for tin at $1.03 per lb. throughout November. The struggle over establishing a reasonable price con-

Average Prices for November (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, Export, Refinery	27.425
Lead:	
Common, New York	19.000
Common, St. Louis	18.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	88.000
Silver, London, pence per oz.	77.000
Sterling Exchange, "Checks"	279.987
Zinc:	
Prime Western, East St. Louis	19.500
Tin:	
New York Straits	103.000
New York, 99% min. (e)	102.000
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	216.304
Antimony (E&MJ) (d)	48.133
Antimony, bulk, Laredo	44.783
Antimony, in cases, Laredo	45.283
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotation.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

tinues. Both producers and consumers believe that the RFC will have to revise its ideas upward to obtain additional supplies.

Though aluminum production has increased, the supply situation is not expected to ease until late in 1952. The United Kingdom has agreed to release 11,000 tons of primary aluminum to the United States during the next five months. The metal will come out of purchases made in Canada. In the nine months ended September the United States produced 619,535 tons of primary aluminum, a gain of 17.5% over the like period of 1950.

"Free" Gold Market

Canada's free gold market has been disorganized by indecision of producers over foregoing subsidy. Lake Shore sold 6,200 oz. at about $38. Up to 25,000 oz. could have been sold without depressing the price. Quotations per fine oz., by Pick's World Currency report:

	Coins		Bars (12.5 kg.)	
	Oct. 30	Nov. 30	Oct. 30	Nov. 30
New York, transit	.....	.....	$39.25	$39.25
Manila	$48.00	$48.50	39.50	39.63
Hong Kong	47.50	46.50	41.50	42.50
Bombay	58.00	56.50	49.25	48.00
Tangier	53.50	54.00	38.75	39.00
Beyrouth	50.00	51.00	39.00	39.25
Paris	55.50	54.00	41.75	41.25
Buenos Aires	56.00	56.00	43.00	42.75

(Markets continued on page 105)

Major Metals

U. S. DAILY AND AVERAGE PRICES

Nov. 1951	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	24.200	27.425	103.000	19.000	18.800	19.500
2	24.200	27.425	103.000	19.000	18.800	19.500
3	No Market	27.425	103.000	19.000	18.800	19.500
5	24.200	27.425	103.000	19.000	18.800	19.500
6	Holiday	27.425	Holiday	Holiday	Holiday	Holiday
7	24.200	27.425	103.000	19.000	18.800	19.500
8	24.200	27.425	103.000	19.000	18.800	19.500
9	24.200	27.425	103.000	19.000	18.800	19.500
10	No Market	27.425	103.000	19.000	18.800	19.500
12	Holiday	27.425	Holiday	Holiday	Holiday	Holiday
13	24.200	27.425	103.000	19.000	18.800	19.500
14	24.200	27.425	103.000	19.000	18.800	19.500
15	24.200	27.425	103.000	19.000	18.800	19.500
16	24.200	27.425	103.000	19.000	18.800	19.500
17	No Market	27.425	103.000	19.000	18.800	19.500
19	24.200	27.425	103.000	19.000	18.800	19.500
20	24.200	27.425	103.000	19.000	18.800	19.500
21	24.200	27.425	103.000	19.000	18.800	19.500
22	Holiday	27.425	Holiday	Holiday	Holiday	Holiday
23	24.200	27.425	103.000	19.000	18.800	19.500
24	No Market	27.425	103.000	19.000	18.800	19.500
26	24.200	27.425	103.000	19.000	18.800	19.500
27	24.200	27.425	103.000	19.000	18.800	19.500
28	24.200	27.425	103.000	19.000	18.800	19.500
29	24.200	27.425	103.000	19.000	18.800	19.500
30	24.200	27.425	103.000	19.000	18.800	19.500
AVERAGES FOR MONTH						
Nov.	24.200	27.425	103.000	19.000	18.800	19.500
AVERAGES FOR WEEK						
Nov.						
7	24.200	27.425	103.000	19.000	18.800	19.500
14	24.200	27.425	103.000	19.000	18.800	19.500
21	24.200	27.425	103.000	19.000	18.800	19.500
28	24.200	27.425	103.000	19.000	18.800	19.500
CALENDAR WEEK AVERAGES						
Nov.						
3	24.200	27.425	103.000	19.000	18.800	19.500
10	24.200	27.425	103.000	19.000	18.800	19.500
17	24.200	27.425	103.000	19.000	18.800	19.500
24	24.200	27.425	103.000	19.000	18.800	19.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Nov. 1951	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	279.9375	88.000	77.000d.	248s.	$35.00
2	279.9375	88.000	77.000d.	248s.	35.00
3	(e)	(e)	(e)	(e)	35.00
5	279.9375	88.000	77.000d.	248s.	35.00
6	Holiday	Holiday	77.000d.	248s.	Holiday
7	279.9375	88.000	77.000d.	248s.	35.00
8	280.0000	88.000	77.000d.	248s.	35.00
9	280.0000	88.000	77.000d.	248s.	35.00
10	(e)	(e)	(e)	(e)	35.00
12	Holiday	Holiday	77.000d.	248s.	Holiday
13	280.0000	88.000	77.000d.	248s.	35.00
14	280.0000	88.000	77.000d.	248s.	35.00
15	280.0000	88.000	77.000d.	248s.	35.00
16	280.0000	88.000	77.000d.	248s.	35.00
17	(e)	(e)	(e)	(e)	35.00
19	280.0000	88.000	77.000d.	248s.	35.00
20	280.0000	88.000	77.000d.	248s.	35.00
21	280.0000	88.000	77.000d.	248s.	35.00
22	Holiday	Holiday	77.000d.	248s.	Holiday
23	280.0000	88.000	77.000d.	248s.	35.00
24	(e)	(e)	(e)	(e)	35.00
26	280.0000	88.000	77.000d.	248s.	35.00
27	280.0000	88.000	77.000d.	248s.	35.00
28	280.0000	88.000	77.000d.	248s.	35.00
29	280.0000	88.000	77.000d.	248s.	35.00
30	280.0000	88.000	77.000d.	248s.	35.00
AVERAGES FOR MONTH					
Nov.	279.987	88.000	77.000d.	—	35.00
AVERAGES FOR WEEK					
Nov.					
7	279.9375	88.000	—	—	—
14	280.0000	88.000	—	—	—
21	280.0000	88.000	—	—	—
28	280.0000	88.000	—	—	—

Calendar week averages, New York Silver: Nov. 3rd, 88.000; 10th, 88.000; 17th, 88.000; 24th, 88.000.

(e) No Market (Saturday).

Correction — London silver, Oct. 25th, 77d.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

E&MJ HIGHLIGHTS

Settling down with this issue over the holidays, you'll notice

- **The cover says "Merry Christmas and Happy New Year"** to our friends from Nome to Capetown and Aachen to Zellidja. King Typographic Service Corp. gets top credit for the cover. King set the type in 25 languages, but could have set it in more than 700. (You rate average if you can read it in one—English.) And coincidentally, a printer named Mr. Bookbinder runs King Typographic.

- **". . . shot dead at the pay table . . ."** With these terse words, F. Stuart Miller starts his story of the Malayan tin miners' struggle against Communist violence. Page 72.

- **Next summer, you could combine a fishing trip** with a worth-while visit to Howe Sound's new mine and mill at Cobalt, Idaho. If you can't do that, turn to page 78 for an up-to-date report on this biggest domestic source of cobalt.

- **Negaunee's engineers** worked with the ground when they laid out the surface plant at the 1.5-million-annual-ton Mather "B" shaft. Harry Swanson's article on page 83 should give you a lot of good ideas to incorporate in your next surface plant.

Major new copper projects brighten the outlook for 1954:

- **Biggest new source** is Copper Range's White Pine mine in Michigan, page 127. Production: late 1954. Rate: 35,000 annual tons of copper. Reserves: 309 million tons of 1.065%—biggest untapped reserve of copper in the U.S. Copper Range's loan: $57,185,000—the biggest since World War II.

- **Highest price for metal**—the first to break the 24½¢ ceiling—was the 25½¢ guarantee for copper from Anaconda's Yerington pit. Production: late 1953. Rate: 30,000 annual tons of metal. Page 107.

- **Latest authorization** was American Smelting's Silver Bell mine, 35 mi. northwest of Tucson, Ariz. Production: late 1953. Rate: about 18,000 annual tons of copper. ASARCO will spend about $17 million on the development; DMPA will guarantee 24½¢ for the first 177 million lb. in the first 5½ years of production.

Montana aluminum plant: Now you see it . . . now you don't.

- **Anaconda had set aside** more than $40 million to build a 108-million-annual-lb. aluminum plant near Kalispell. Page 107. That was after the Government had tentatively accepted, then rejected Harvey Machine Co.'s offer to build the plant.

- **Next, the Justice and Interior Departments** came to the extraordinary conclusion that entrance of another strong competitor would promote monopoly. His agencies were in a squabble, so Truman decided to settle it himself.

- **And rising to Anaconda's defense,** AFL, CIO, Senator Murray, and various Montana civic organizations have endorsed the Anaconda plans.

Two metallurgical riddles may soon be solved:

- **For its previous unworkable oxidized lead-zinc ore,** Combined Metals Reduction Co. may start a new plant in 1952. Page 108.

- **A way to utilize nickel from Oregon garnierites** may result from pilot-plant studies by M. A. Hanna Co. and the USBM. Page 108.

Quote of the Month:

- **"I'm not going to be a party** to throwing a lot of money down the drain. I'm not going to buy a lot of unusable substandard materials for stockpiles which would only stand as a memorial to squandering the taxpayer's money." Jess Larson.

ENGINEERING AND MINING JOURNAL

DECEMBER, 1951

Bulls in Tin Shop

DOMESTIC CONSUMERS are now being required to reduce their use of an already scarce tin supply. Economic distress in Malaya and Bolivia is likely either to advance the Communist objectives in these countries or call for new outlays at the expense of our hard-pressed taxpayers to prevent this advance. The unity of the Western world is impaired and Uncle Sam has added to already abundant evidence that in international affairs his promises cannot be trusted. Stockpile accumulations of tin have been set back.

A publicity-hungry Senate committee and a headstrong political favorite are responsible for the mess in tin. Not many months ago the Johnson committee took a quick look and raised a fuss about the high price of tin. Taking a similarly quick look, RFC's czar Symington took the principal buyer out of the world market and collapsed the tin price. Ever since, these johnny-come-latelys have been in a tussle with the tin producers, trying to hold the tin price down to a level which can be used for favorable domestic publicity.

That the tin price was too high we would certainly not dispute. To correct it, however, did not require repudiation of the previous US position nor hasty, flamboyant action. The club could have been left in the corner and merely pointing to it would have shaken the speculative influence out of the market. In order to dry up speculative price kiting, it was not necessary to multiply the already serious troubles of the producers who had been trying to meet the urgent requests of US officials to increase production. To add to the chaotic, menacing situation portrayed on pages 72 to 77 of this issue was dangerously irresponsible and unwarranted.

The record shows that the official US position since the war has been one of exhorting producing countries to expand production, and forecasting a market. Nobody but a nitwit would presume that this job could be done except under favorable prices in the face of world wide inflation and the demands of local people for better wages and working conditions. The US has a large share of responsibility for both these movements. We can understand the bitterness of producers at our washing our hands of these responsibilities and leaving them to cope with the consequences while we now cultivate favorable domestic publicity by denying them a market.

Pulling the rug out from under Malaya, despite the desperate struggle with Communism that has been going on there and its key geographic position, seems to be a hobby with our Government, as we have done it in both rubber and tin, the country's principal export products. This also pulled some important dollar-earning props out from under the sterling bloc, the bill for which we predict will land in the lap of the US taxpayer. We hope part of the bill won't have to be settled in blood, although to be realistic we must acknowledge that an increase in blood letting is an inevitable result of what we have already done.

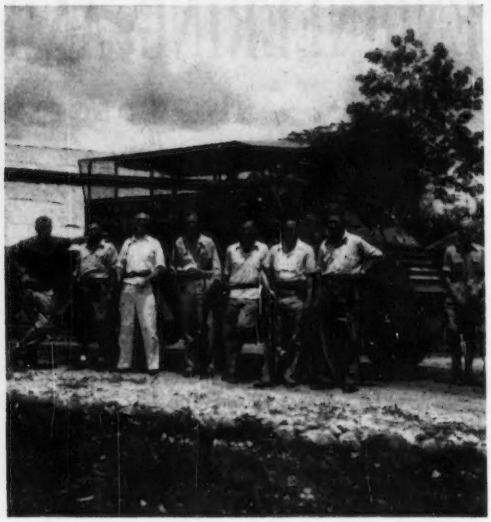
To the bewildered Bolivians the gyrations of US policy must be not only maddening but completely beyond comprehension. Mr Symington and Senator Johnson may assume no responsibility for the views of Henry Wallace, the CIO, or various other US emissaries but they nevertheless came to Bolivia either as officials or under official auspices and preached the doctrine of more abundance for the common man and other social benefits enjoyed or hoped for in this country. Bolivia has lots of common people who regard a full stomach as something of a luxury and it is inevitable that their aspirations, helped along by the advice of our representatives, have an impact on tin production costs. Bolivia, also following our advice and example, has social programs which are expensive, and is placed in real financial jeopardy when the price of its principal export is arbitrarily plummeted.

In brief, such bungling as our so-called leaders have committed in tin will not only add to the woes of taxpayers all over the world, our own particularly, but will take a toll in bloodshed as well. A fair price for tin would be higher than the level demanded to save our politicians' faces.

Communist terrorism . . .

IN THIS HEADQUARTERS in Kuala Lumpur, Malaya's capital, Communists planned the insurrection they launched in June, 1948. Guerrilla warfare still rages throughout country hampering tin and rubber production.

. . . forces mines to arm staffs . . .



MINING SUPERVISORS go armed. Here are, from left: W. C. Baker, W. Muir, F. W. Gurr, H. F. Way, J. E. Lusney, F. S. Miller (author of this article), W. Johnson, G. E. Goolden, all of Pacific Tin Consolidated Corp.

Is the U. S. right or wrong in forcing down the price of tin?

Before answering, you should know . . .

What It Means To Mine Tin Under Malayan Communist Attack

F. STUART MILLER
Vice-President
Pacific Tin Consolidated Corp.
New York, N. Y.

ON JUNE 4, 1948, E. V. Dabb, manager of the Idris Hydraulic tin mine near Kampar, Perak, Federation of Malaya, was shot dead at the pay table by six armed Chinese as he was supervising the distribution of pay to his mine laborers. The killers made off with $2,500 intended as wages.

This was not an isolated act of terrorism, nor was the motive pure robbery. It marked the beginning of a coldly planned campaign directed against the tin mines and rubber estates of Malaya. Its aim is to throw these key industries into confusion, and thus to win control of Malaya for the Communists.

Three and a half years of combating Communist attacks have put severe stress on Malayan government and industry. To continue as an effective part of the free world, Malaya needs our help.

Pictures on this page by Norman Cleaveland, all others by Birte Steincke, Kuala Lumpur, Federation of Malaya.

We Need Malaya

Prior to World War II, Malaya produced 1/3 of the total world supply of tin. The 1935-41 average output of Malaya was 62,800 long tons of tin contained in ore. The world average was 191,000 tons.

The Southeast Asia countries together (Malaya, Siam, Burma, Indo-China, Indonesia, and China) accounted for about 2/3 of the world's tin production in that period. During the war, all these countries were lost to the Japanese. At present Malaya is the most secure of any of them, but it could be lost again. It is a loss we could ill afford, because the bulk of its tin is consumed in the U. S.

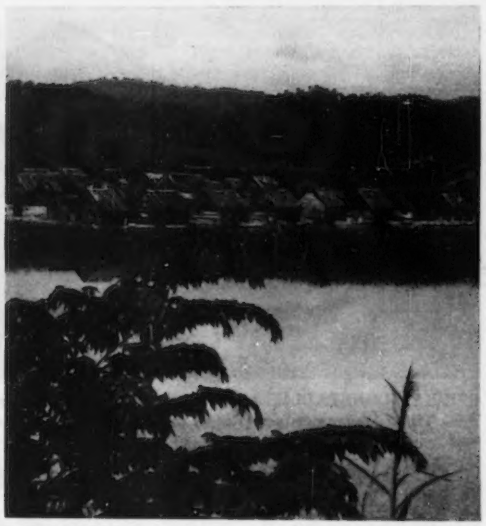
When the Malayan mining properties were recovered from the Japanese at the end of the war, every effort was made to get them quickly back into production. The incentive was two-fold. Not only was the world starved for tin, but the mining companies had been without operating income, and their shareholders without dividends, through the whole Pacific war.

However, destruction and looting of old equipment, plus delays in getting new equipment, handicapped rehabilitation. Malayan production for 1946 was only 8,432 tons of tin. The first dredge to resume operations was Dredge No. 6 of Pacific Tin Consolidated Corp., which went into production on March 1, 1946.

By 1950, tin production had climbed to 57,500 tons in Malaya, a noteworthy achievement in view of slow deliveries of equipment and

. . . to defend properties . . . **. . . and requires native resettlement**

FORTIFIED POSTS, like this one at Pacific Tin's Ampang property, protect mines. Note parapet of sand-filled double walls. Sandbags deteriorate too fast in tropics. Each company helps organize and train constables like these.



RESETTLEMENT, under Government's "Briggs Plan" is one way of protecting native population against Communists. This is new settlement near Ampang. Water in foreground fills old open-pit mine working.

the outbreak in 1948 of the Communist attacks already mentioned.

The guerrilla war launched by the Communists is now well into its fourth year. Output of tin from Burma and Indo-China lags below pre-war levels as a result of Communist disturbances there. Siamese mines have been slow in rehabilitation. China has been lost to the western world as a source of tin. This leaves to Malaya and to Indonesia an even larger share of responsibility for maintaining Southeast Asia's tin production.

How Communists Organized

Captured documents reveal that the Communists decided at a party conference in Calcutta in March, 1948, to instigate violent labor disturbances throughout Malaya during April and May, 1948. These were to be followed by open insurrection in June. The party actually hoped to set up a Communist "Republic" by August, 1948, and eventually to overthrow the Malayan Government.

The Malayan Communists got their orders from Calcutta and went to work. The shooting of Mr. Dabb was one of the first atrocities, but there were many others. On June 16, three European rubber estate managers were killed in the Sungei Siput area of Perak. This was the work of a killer squad of a dozen armed Chinese. Each manager was led outside his office, tied up, and machine-gunned at point-blank range.

This pattern of assault and murder has been followed through all the tin and rubber areas. Although the insurrection failed to win the support needed to overthrow the Government, it has built up an undeniably effective guerrilla organization.

The Malayan Communist Party operated legally and openly in the country both before and after World War II. During the Japanese occupation, the Communist's well-knit organization formed the nucleus for organized resistance against the Japanese. Armed bands operating from jungle hideouts called themselves the Malayan People's Anti-Japanese Army, or MPAJA. Toward the end of the war, these bands were supplied with arms and ammunition by Allied planes and submarines. The MPAJA was made up almost entirely of Chinese, who comprise 40% of the population. Except for a few of the leaders, the members were distinctly youthful in age. The Communist party has had little attraction at any time for the Malay and Indian elements.

The MPAJA did survive in the jungle under Japanese attack, and it had some success in harrying the Japanese. But it also preyed upon the native population, both Chinese and Malay. At the end of the war some of its members were lionized by the British. Although return of all arms was urged, many of the arms used by the MPAJA were never turned in.

After the war the Malayan Communist party operated openly from a prominent headquarters in Kuala Lumpur. Government retaliation after the first attacks drove the Communist Party back into the jungle. Building from the remnants of the old MPAJA, the party now fights and maintains itself through two broad organizations: one, the Malayan Races Liberation Army, or the MRLA, comprises the assault troops; the other, the Min Yuen, or People's Movement, acts as a liaison, supply, and propaganda arm for the MRLA.

The MRLA consists largely of gangs of 30 to 50 men, each acting as a military unit and assigned to one of ten designated regiments. These operate in prescribed areas under orders of military commanders and Communist political leaders. They are subject to the overall control of a hierarchy of district and State Communist committees.

Top command is exercised by a Federation Communist Committee under the chairmanship of Chin Peng, secretary-general of the Malayan Communist Party. Only 30

Fighting Communism is part of mining in Malaya

SPECIAL CONSTABLES are maintained by mines. Here is squad at Pacific Tin's Ampang mine with G. E. Goolden, security officer, at left.

ON PATROL, squad of special constables passes Pacific Tin's Ampang dredge. It is frequently fired on by communist guerrillas.

CHAIN OF POSTS, like this, guards gravel pump mines near Ampang. Chinese and European mines contribute to support.

OUTLOOK from post shows open pit mine (light spot) often raided by Reds. Lei Chin Fei, gang leader, was killed near here.

years old, he has a price of $80,000 (Malayan currency) on his head.

Most of the military units wear regular khaki uniforms and caps with the Communist three-star insignia. Numerous red Communist flags with their three gold stars have been captured. Discipline is strict, and laxity, disobedience, or attempted desertion are punishable by death. In camp in the jungle, these men get a surprising amount of straight Communist indoctrination in lecture courses and speeches.

For a full picture of the life and operations of the old MPAJA guerrilla bands, read Col. F. S. Chapman's excellent book, *The Jungle Is Neutral.* His account is as applicable to the Communists in the jungle today as it was then. In fact, many of the men involved are the same.

It is estimated that there were less than 5,000 men in the armed Communist units early in the "Emergency," as the Communist insurrection is locally called.

Through August, 1951, the MRLA suffered 4,921 known casualties, including 2,376 killed. However, their losses have largely been made up by recruitment, and there still may be 4,000 to 5,000 men under arms.

Each separate MRLA company unit (30 to 50 men) is supported by Min Yuen cells in the towns and villages and among the Chinese laborers and squatters. The Min Yuen provide food, supplies, and recruits, as well as intelligence information, and carry on extensive Communist propaganda in their areas. It is estimated that the Min Yuen are many times greater in numbers than the armed MRLA.

How the Communists Attack

Most frequent objects of attack have been the rubber estates and the Chinese open cast mines. The European-run dredges are apparently considered too difficult targets for direct attack, except in special cases where they are undergoing repair or rehabilitation. There have been a number of attacks on dredge camps and on personnel en route, but so far as I know there has been no attempt to seize an operating dredge by force of arms.

Communist attacks are all based on the hit and run principle. They are fond of late afternoon or early evening ambushes or surprise attacks on isolated police stations or small police patrols. From hidden positions at a road-cut they open fire when key vehicles of a convoy

are directly in the cross fire of their automatic weapons at close range. Thus they feel sure of getting the drivers in the first bursts, leaving the other occupants at their mercy. Success in these attacks is particularly valuable to them as it leads to the capture of much-needed weapons.

So many attempts have been made to shoot up or derail trains on the country's lines that the night mail trains between Singapore and Kuala Lumpur have been abandoned, and only a few trains weekly are run during the day. Interurban and suburban buses have been held up and burned, and even in Singapore reports are common of cab drivers being forced to drive to the outskirts, where their cabs are burned. Telephone and power lines are cut and water supply mains have been broken.

Despite the Communist propaganda line that their aim is to drive the British out of Malaya, the brunt of their violence has fallen on the Chinese, who make up about 40% of Malaya's population.

Chinese gravel pump mines are most exposed to Communist attack. Buildings are burned, pumps and engines wrecked, key personnel killed or abducted. These attacks are part of a systematic effort to collect protection money from Chinese mining companies and individual employees. Arson and murder have in many cases been in retaliation for a refusal to meet extortion demands for money, food, or services.

Kuomintang leaders, and Chinese considered to be informers, or other traitors to the Communist cause, are the objects of specially planned murder attempts.

The Ampang Gang

Operating near the mining village of Ampang, only six miles from the center of Kuala Lumpur, the Federal capital, the so-called Ampang Gang is a good example of a Communist unit's tactics.

Leader of the Ampang Gang for over two years was Lei Chin Fei, formerly head of a Communist-dominated labor union in Ampang. He made his headquarters in the offices of the New Democratic Youth League on the main street of Ampang Village. Local mines, including the Pacific Tin Company, dealt with him directly on labor matters.

At the outbreak of the Emergency, Lei led his followers into the jungle to previously prepared camps and began a systematic terrorization of the Ampang area. His unit was not a part of the MRLA, but rather a special armed unit of the Min Yuen. From their nearby jungle hideouts, Lei's men penetrated the thickly settled mining and squatter areas around Ampang, disguised by day as ordinary Chinese squatters, in uniform at night. By threat, and proof, of retaliation, they built up a widespread system for collection of protection money and food supplies. A captured Communist messenger said that Chinese mines paid Lei $100 Malay ($33 U. S.) per sluice per month for protection, and that the gang collected $2 Malay per month from each individual mine worker. For refusing payment, the Moe Pak Kion mine had its pump houses and other buildings burned at 8 pm Sunday, April 10, 1949. Workmen were held prisoner for an hour then released unharmed. *They* had paid!

According to police estimates, the thickly-settled squatter area of Ampang yielded more revenue to the Communists than any other area in Selangor. At least this was true up to Jan. 29, 1951, when Lei Chin Fei met his death at the hands of a police patrol.

As far as is known, the core of this gang is still intact, although Lei's loss has cut down its effectiveness. The key to elimination of such units is information from the people on whom they prey, and with whom they merge to become indistinguishable, when attacked. The Chinese squatters, villagers, and laborers are not, for the most part, Communist sympathizers. They yield through fear. Once they feel they can rely on Government protection from retaliation, they can give information that will severely curtail Communist operations. The Government is now trying to give that assurance.

Government Fights Back

At first, Government action was retarded because of the necessity under British Law for legally gazetting various emergency regulations before any steps were taken under them. The Communist attacks began early in June, but it was not until the night of June 20 that the entire detective force of the Malayan police descended on the offices of the Communist Party and affiliated organizations to round up all known Communists and sympathizers. The raid netted 600 suspects, but the leaders, like Lei Chin Fei in Ampang, had already escaped to jungle hideouts or gone "underground."

Then began the series of combined operations by the police and the military against the MRLA. One of the first took place on July 11, 1948, when a squad of 18 Communists, some armed and in uniform, was wiped out at the Tuck Onn mine, which adjoins the Ampang property of Pacific Tin.

Communists Build Camps

From the spot where the group was found, a trail led back to a camp capable of accommodating 100 men, which the Communists had been preparing even before the Emergency as a training base for recruits from Selangor and Perak. The camp was 600 ft. above the Ampang Valley. It consisted of bamboo and attap lean-to huts at five different points on the jungle hillside. No one of the buildings could be seen from any of the others, nor could any part of the camp be seen for more than a few yards down the steep access trail.

The buildings were furnished with bamboo sleeping platforms, tables and chairs. There was a good water supply, a kitchen, and latrine pits with bamboo seats.

The camp was guarded by sentry posts and a vantage point that overlooked the whole valley. Food was to come from Chinese squatters living about a mile away. The camp was destroyed, but the Communists built others.

This camp was only a little over three miles from the house in which I was then living. I heard the police-military convoy go out along Ampang Road before dawn that Sunday morning. Later I watched them come back with their captives under guard and three dead Communists draped over the back of a jeep. That operation brought home the nature of the Emergency to the Pacific Tin company!

From the outset, the British authorities have made strenuous efforts to bring the situation under control. In the first week of the Emergency, military reinforcements were ordered up from Hong Kong. The Second Guards Brigade and a succession of other crack British Army regiments have been sent to Malaya in rotation to take part in anti-guerrilla operations.

In recent months the total security forces in Malaya have amounted to about 30,000 troops, including British Regulars, Gurkhas, the Malay Regiment, and the RAF, in addition to police and constabulary of about 110,000. A large part of

the police, particularly the special constables, is tied down to static guard duty at mines, rubber estates, power plants, and police stations. The main effort of tracking down the Communist gangs falls to the military and the special police jungle squads.

Early in the Emergency a system of identity cards was established, which involved fingerprinting and photographing the entire population of the Federation. Lack of a card means arrest. The Communists, in turn, make special raids to collect and destroy identity cards.

In some areas curfews are imposed to make it easier to check unauthorized movement. In these places anyone abroad after dark may be shot on sight.

The Briggs Plan

Despite all this, it became evident in the first months of the Emergency that anti-guerrilla efforts were making no real progress. One of the chief hindering factors was the reluctance of the populace to inform against the Communists for fear of retaliation. The Min Yuen was so widespread, especially in the squatter areas, that it was impossible to tell who could be trusted.

Early in 1950, Lt. Gen. Sir Harold Briggs was sent to Malaya in a civilian capacity as director of operations over both police and military forces. In April, 1950, he began to put into effect what has become known as the Briggs Plan. Its primary objectives are to isolate the guerrillas in the jungle from their outside supporters and to concentrate the military effort in one section of the country at a time.

The key to isolation of the guerrillas was resettlement of the squatters. These number some 450,000, mostly Chinese, out of a total population of over 5 million. They settled on unused land, to which they had no title, principally during the Japanese occupation.

The Briggs Plan calls for moving the squatters to new areas where proper protection can be given them, as well as improved educational, sanitary, medical, and transportation facilities. By the middle of 1951, 280 new villages containing 290,000 persons, had been established. These villages are fully protected, including armed guards. Gardens are assigned on land nearby, cooperative stores are being set up, and the beginnings of democratic government supplied through election of village committees.

A second phase of the plan calls for regrouping of mine and estate labor into centralized locations more easily protected. Often this means that mines or estates have to bear the cost of whole new housing developments.

A third phase was organization of Kampong Guards, a home guard recruited in each village. Despite the possibility that arms issued to these guards might be diverted to the Communists, equipping the guards with shotguns has shown satisfactory results. Numerous raids on isolated villages have been beaten off by determined guards armed with these inferior weapons.

The Communists' reaction suggests that these measures are having considerable effect. The guerrillas attack resettlement areas vigorously, and they try to infiltrate new areas with the Min Yuen.

In February 1951, when movement into the large resettlement area near Ampang Village was at its height, there was firing between guerrillas and guards on duty for 21 consecutive nights. Pacific Tin's Ampang dredge operated in this cross fire throughout.

Mines Defend Themselves

From the outbreak of violence in June, 1948, the mining companies made every effort to protect their personnel and properties. The police and the military were strained by calls from so many points that the mines had to depend largely on themselves. It was apparent that even obtaining arms would be a problem.

There was nothing available in the country but a few pre-war Lee Enfield rifles and a limited number of Sten guns. No means could be found to clear air shipments of arms from England. Efforts to have arms flown in from Australia failed because of the attitude of the Australian Government.

Pacific Tin, as the only American tin mining company in Malaya, had turned at once to the U. S. for arms to be flown across the Pacific to protect its staff. The American rubber companies did likewise. Early in July 1948 the F. M. S. Chamber of Mines gave up trying to get arms through from England, and it was arranged to add the Chamber's requests to the Pacific Tin arms order.

By July 28 Pan American Airways had delivered in Singapore from San Francisco, 162 submachine guns, 60 riot guns, 315 revolvers, and 70,000 rounds of ammunition.

The program of defense then carried out by Pacific Tin illustrates the scope of the measures adopted by the industry generally.

The first requirement was to recruit and train a body of armed guards to man defense posts around the mines and camps and to perform escort and patrol duties. One of the European staff with extensive jungle experience was assigned as Security Officer to devote his full time to the program. He supervised the recruitment, training, duty assignments, and discipline of a corps of Malay special constables. The police helped in training the men, and supplied some experienced men as NCO's, but a large part of the burden fell upon the company.

Pacific Tin was among the first to secure armored cars from old wartime stocks in local government hands. These had to be overhauled and rehabilitated in the company workshops. Five armored cars are used by Pacific Tin on its three operating properties. Every shift is escorted between mine camp and dredge by armored car.

In addition, guards were established at all necessary points about the camps and on the dredges. A total force of 125 to 140 special constables was necessary for the three operating properties of Pacific Tin. All European personnel carry arms whenever outside of the towns.

In Ampang, known as a center of Communist activity ever since the Japanese occupation, an elaborate defense scheme was worked out, under Government prodding, to protect the Chinese mines in the area and the one dredge of Pacific Tin from the Ampang Gang, already mentioned.

Eight fortified posts were built on commanding positions around the mining area, six on Chinese gravel pump mines and two on the Pacific Tin property. The six were paid for out of the Ampang Chinese Mines Security Fund, and two were built by Pacific Tin. Each accommodates a squad of 12 to 20 Malay constables under an NCO, who live there and maintain guard duty day and night. Provision is made for lighting at night, for signal systems, and telephone communication with the Pacific Tin head office.

The Present Situation

In spite of all defense measures, casualties among civilians and the security forces mount at a rate which, in total, exceeds that of the

Communist losses. During three years and two months of guerrilla warfare from June, 1948, through August 1951, 2,376 terrorists were killed, of whom about 2,220 were Chinese. Another 1,129 were wounded, but escaped, 823 were captured, 593 surrendered, making a total of 4,921 counted casualties. In addition, about 11,000 Communist supporters were deported to China, and 8,000 are still held in detention camps for further investigation.

During the same period, 1,654 civilians were killed, of whom about 75 were Europeans, 1,120 Chinese, and the remainder Malayans and Indians. In addition, 994 civilians were wounded and 430 are missing. Among the security forces, 1,158 were killed, 1,369 wounded, and 466 are missing. This makes a total of 6,071 casualties.

It is still hoped that as the Briggs Plan is pushed ahead, the effect of isolating the Communist gangs will become evident on a cumulative scale. There is some evidence that Communists are hard pressed for food, and information is coming to the security forces more freely. A larger number of Communist leaders on the wanted list has been killed this year than previously.

Attacks Go On

Yet the number of armed guerrillas in the MRLA remains nearly the same. Serious incidents occur all over the country at the rate of about a half dozen a day. Min Yuen cells are known to be active in towns and villages, among mine and estate labor, even in some resettlement areas. They continue to get backing in terms of violence from the armed units of the MRLA. It is not believed that the Malayan Communists receive any material help from Communists outside Malaya, but instructions, and instructors, must pass back and forth.

The key to the struggle in Malaya is the winning of the bulk of the Malayan Chinese to active support of the anti-guerrilla campaign. It is reliably stated that 95% of the Malayan Chinese, by their own inclination, are anti-Communist. The news from China these days appears to be strengthening this feeling.

Yet many of the Chinese prefer to remain on the fence to see who wins in Malaya, and indeed all of Southeast Asia, before they commit themselves by any overt act. Allied defeats abroad might change the whole Malayan picture with surprising suddenness. Every Communist victory in Korea, Indo-China, or Burma, even a propaganda victory, helps the MRLA in terms of material assistance as well as morale. The situation remains extremely delicate despite the optimistic tone of official publicity releases.

The Effect on Mining

No separate casualty figures for the mining industry are at hand. Mining has not suffered as severely as the rubber industry, but at least 16 European dredgemen have been killed, as well as Chinese mine owners, managers, and foremen. Many others have been shot at or suffered narrow escapes. The cumulative effects of the strain of such conditions have been felt by most of the mining personnel, but especially by those bearing major responsibilities.

It is to the great credit of the miners, both European and Chinese, that they have stuck to their posts and maintained Malayan tin output at such a high level, while living under constant threat of attack. Some American companies in other industries have evacuated wives and children of their American employees from Malaya, but none of the mining companies, either British or American, has yet taken this step.

So far, practically all operating dredges have been able to continue production, except where economic factors were decisive. But from now on, when a dredge completes mining its present property, it will no longer be possible to have another property prospected, developed, and ready for it to move to.

Prospecting is at a standstill. Parties using the standard methods of alluvial prospecting are particularly vulnerable to attack, the more so since the most likely remaining areas are in the remote sections where terrorist danger is greatest. Even if mining companies were prepared to take the risk of sending out parties, the police would not permit them to go where they cannot be protected adequately.

In 1947 and 1948, Pacific Tin prospected two new properties in the jungle and decided to proceed with preparations to mine them. Since the outbreak of the Emergency, it has become not only impracticable to equip these properties, but impossible, by decision of the authorities, even to visit them to complete surveys. The attendant risk is too great, and sufficient escorting forces to ensure safety are not available. This has caused serious delays in plans for restoring to production dredges that were operating before the war, but which have little or no ground left to work in their present locations.

The halt in prospecting came at a bad time for most companies. Prior to 1940, prospecting lagged because of the apparent excess of productive capacity. In 1940 and 1941, all efforts were turned to maximum production for war requirements. During operations by the Japanese, ore reserves were wasted by poorly planned mining methods. Immediately after the war, rehabilitation had first priority. Prospecting was just getting under way for the first time in a decade when it was cut off by the Communist attacks. As a result many companies find their ore reserves being rapidly depleted.

Chinese gravel pump mines are much more flexible than dredging operations, but they are even more vulnerable to the present restriction of prospecting. A number of these mines are approaching the end of their ore with no other mineable ground in sight.

Problems Multiply

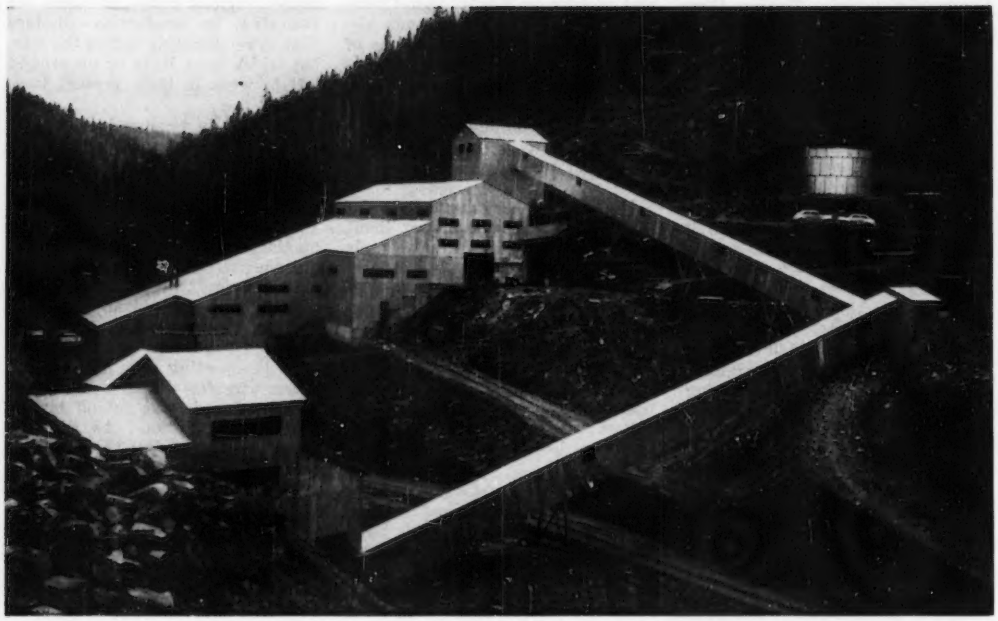
Although the lack of opportunity to prospect is the most serious threat to the future of Malayan tin mining, the Communist attacks have set up other formidable problems. Efficiency of operation has fallen off at all types of mines, owing to the need to divert men and time from production to defense. There is also a shortage of mine labor, and resettlement and regrouping programs have aggravated the shortage locally.

General efficiency of mine labor has fallen off; curfews and police screening of labor add special complications. Where miners cannot go to and from work in curfew hours, dredges have to be run on one 12-hour and two 6-hour shifts. Some complete shutdowns have resulted temporarily.

Ever since the war there has been a shortage of electric power in Malaya. Mines in some areas have had to shut down for three to six hours each day under power restrictions. The cutting of power lines by Communists has been a minor but irritating source of lost time.

From a financial standpoint, the Emergency has placed a heavy burden upon the mines. They have had to bear the cost of most of their

(Continued on page 120)



DIFFERENTIAL FLOTATION is used in this 1000-ton concentrator at Cobalt, Idaho, to separate a copper, a cobalt, and an iron product.

Idaho Cobalt For U. S. Defense

Spurred by a stringent shortage of cobalt for jet engines, shells, and other weapons, Calera Mining Co. pushes ahead with its Idaho mine and Utah refinery. Here is a progress report on the new mine and mill.

JOHN B. HUTTL
Associate Editor

CAREFULLY-LAID PLANS that were formulated back in the period before cobalt reached its present position of critical scarcity were all that enabled Calera Mining Co. to respond rapidly to the Government's plea to add 40% to the capacity of its new cobalt concentrator.

As a result, the company will be producing before long well over 3 million lb. of cobalt metal anually, plus a substantial tonnage of copper.

This production will come from the company's Blackbird mine in central Idaho, where the new concentrator has been producing some cobalt and copper concentrates since the middle of September, 1951. The cobalt product will be treated in a refinery now being built near Garfield, Utah. The refinery is notable for its use of a new leaching and precipitation process worked out by Chemical Construction Corp. Upon completion of the refinery, mine production will be increased to 1,000 tons daily.

A preliminary report covering history, geology, early exploration, and construction was published in *Engineering and Mining Journal* for October, 1950. I visited the property again, and this article is a progress report on this highly interesting and important venture.

To summarize briefly some of the background of the project, the Blackbird mine lies in a mineralized belt about 10 miles long and 4 miles wide, which extends northerly across the West Fork of Blackbird Creek to and beyond Panther Creek.

The principal settlement in the district is Cobalt, site of the attractive model town built by the company. Access to it is afforded by three different routes: from Salmon, the county seat, involving 42 mi. of travel; from North Fork, and from Challis, 60 and 48 mi. distant, respectively.

The road from Challis has been improved and graded for heavy traffic by the U. S. Forest Service. A contract has recently been let for placing a layer of gravel on the Challis road. The mine and concentrator are about 9 mi. from town, with the company sawmill, which provides lumber for construction work and the mine, situated at the halfway point.

The rocks of the Blackbird mine are strongly sheared gritty quartzite and argillaceous schist of the pre-Cambrian Belt series. At points they are sheared and crumpled, alternately hard and soft, and jointed in several directions. The ore occurs as siliceous veins and lenses containing pyrite, chalcopyrite, pyrrhotite, and cobaltite, or as zones of

A Quick Look At The Problem Of Cobalt

1. What is cobalt used for?

In peacetime, cobalt goes largely into high speed steels, Alnico magnets, cemented carbides, cast alloys, and various nonmetallic uses. In wartime, cobalt goes into jet engines, armor plate, armor-piercing projectiles, electronic equipment, and other weapons.

2. Why is the metal in short supply?

With domestic production and imports about in balance with peacetime consumption, soaring military demands in 1950 drove potential industrial demand, plus stockpiling, far beyond domestic production of about 1,500,000 lb. and imports of about 5,500,000 lb. There were no new sources of cobalt readily available anywhere. Cobalt currently sells at $2.40 per lb., fob. Niagara Falls. In 1948 it sold for $1.70; cobalt in ore was priced at $0.70 per lb.

3. Where does U.S. cobalt come from?

Bethlehem Steel Co. and St. Louis Smelting & Refining Co. have been the only U.S. producers. Union Minière in the Belgian Congo is the world's largest producer. Other producing countries are Northern Rhodesia, French Morocco, and Canada. All these make up 95% of the world's production of cobalt.

4. What new sources are being developed?

In the U.S., Calera Mining Co., a Howe Sound subsidiary, is building a refinery in Utah with an eventual planned capacity of well over 3 million lb. St. Louis Smelting, a National Lead subsidiary, is expanding its Fredericktown, Mo., plant to an eventual capacity of 2 million lb. annually. The Nicaro nickel ore from Cuba, mined jointly by the Biliton Co. and National Lead, may yield a substantial quantity of cobalt metal.

Outside the U.S., Rhokana Corp., Northern Rhodesia, is starting up a new cobalt leaching and electrolytic plant. Some of the increased output will come to the U.S. The ECA is helping here as well as in French Morocco, which will also send cobalt to the U.S. via Canadian refineries. The Cobalt, Ont., area is reviving, but some smelting problems are unsolved. Sherritt-Gordon is planning a new refinery in Alberta for its Lynn Lake ores. Its capacity will be 300,000 lb. annually. Falconbridge and Inco will expand production as fast as possible. Union Miniere will do likewise (see p. 92).

5. What new processes are in sight?

Of greatest significance in cobalt production is the new leaching and precipitation technique pioneered by Chemical Construction Corp. of New York. Based on work growing out of the company's experience with ammonia plants, the process involves either acid or alkali leaching of sulphide concentrates, followed by precipitation of the cobalt as metal powder. Now in pilot plant stage at Sherritt-Gordon's Ottawa laboratories, and at Chemico's lab. for Howe Sound's Calera operation and National Lead's Fredericktown plant, the process should be in commercial operation in about two years.

Continental Ore Corp. and Tennessee Products & Chemical Corp. are developing still another cobalt refining process in a pilot plant at Chattanooga. It will use the Voos technique, which involves preparation of a cobalt carbonate slurry from the ore, then drying, roasting, and retorting it to metal; or electrolyzing a solution made by dissolving the slurry in formic acid. Dr. Voos is in Chattanooga at work on the problem.

6. What is the outlook on cobalt?

If all the sources now being developed are carried through as planned, and are successfully operated, cobalt production available to the U.S. could total over 13 million lb. in 1955. This should take care of even a shooting-war consumption of the metal, if civilian consumption is restricted.

But if war has not come, and if defense spending has tapered off by then, as planned, there will be cobalt to spare. New uses have been developed, however, and no one can safely predict what the eventual peacetime consumption might be. Meanwhile, cobalt will be out of reach of all but the most essential consumers.

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soft, crumpled schist laced by thin cobaltite veinlets.

Principal deposits developed by underground workings driven northwest along the ore-enclosing rocks for 7,000 ft. are the Brown Bear and the Chicago. In the Brown Bear the ore in general is low in sulphide and often occurs as nearly pure cobaltite grains in quartz-biotite schist, while that in the Chicago is high in sulphide and quartz. The walls in both the ore zones are poorly defined and require close assay supervision.

Mining widths for the Chicago vary up to 40 ft. and average about 15 ft. Ore shoots strike northwest and dip 50 to 75 deg. In the Brown Bear deposit the mineralized schist-ore zones strike north, dip almost 90 deg., and plunge 30 to 35 deg. N. The orebodies occur more or less *en echelon* toward the northwest for about 1,000 ft. Their southern tips, in places, merge with one another and terminate against a northwest-trending shear zone dipping 50 deg. northeast. From this point they extend north as much as 100 ft. and have widths of 5 to 30 ft.

The principal mine opening is the 6,850 haulage level some 7,000 ft. long. Its portal is a short distance from the new crushing plant. All development work and mining is done about the 6,850 level horizon. Other levels established include the 7,100, 7,200, 7,300, and 7,400. A new level, the 7,000 is now being driven.

As to vertical openings, there is the old Brown Bear two-compartment shaft which serves as the main entry for the 6-in. wood-stave sand-fill pipe line. At this point it might be appropriate to state that both underground and milling operations are still in what may be called the "breaking-in" and test stage and therefore are subject to modification and improvement.

Several stopes are ready on 7,100 level for mining by horizontal cut and sand fill. This is done by driving a raise up the plunge of the orebody to serve as a service opening, auxiliary escape, means to bring in sand-fill pipe lines, and for ventilation. This is followed by establishment of a two-compartment ore pass, cribbed, the manway containing space for ladder, power cables, and possible timber skip if it is needed.

Ore is mined by a series of slices, each 7 to 8 ft. thick, with sand fill before starting a new slice. Drilling is done with light drills mounted on pneumatic pushers and steel with tungsten carbide bits. For blasting, No. 3 and No. 4 Atlas powder detonated electrically is used. Scraper equipment employed in the stopes includes 5, 10, and

15-hp. electric-driven slushers, and 30- to 36-in. scrapers.

Size of the two-compartment raises is still experimental, and is determined by slope of the raise. The width varies from 4 to 5 ft., and the height from 5 to 8 ft. Development headings on the intermediate levels are driven 7½x6 ft. in cross-section, and haulage levels 6½x8 ft. All drifting operations are carried on with pneumatic pusher-type drills using steel fitted with tungsten-carbide bits.

Broken material is handled by mechanical shovels. Haulage equipment on the intermediate levels comprises 20 and 30-cu. ft. rocker dump cars and 5-ton Diesel locomotives. An 8-ton Diesel locomotive and 178-cu. ft. cars operate in the main haulage tunnel, the 6,850. The loaded cars are dumped into the coarse-ore bin at the head of the crushing plant by means of a rotary dumper.

Sand-Fill In Batches

Of particular interest is the novel and extensive sand-fill installation tested and ready for operation. It is perhaps the only plant in the United States designed to fill an "upside-down" mine. It means pumping mill tailings to the highest head known . . . 760 ft. to be specific.

Preliminary investigation of the problem took into consideration the possibility of underground entry but the many adverse factors disclosed by the study decided the adoption and installation of the surface plant to be described briefly. The main operating difficulty faced today is possible freezing of pipes during the winter months. Plans call for running the plant as a batch operation to be completed within an eight-hour shift.

Five Pump Stations

As built, the pumping system consists of five separate pump stations installed on the surface at predetermined points, each containing two Frame B-41-5 Hydroseal pumps, 6-in. rubber-lined Flex check valve, and a 5-in. solenoid-operated dump valve, all connected to a 6-in. wood-stave pipe line extending from the foot of the concentrator to the collar of the Brown Bear shaft. Total length of this surface pipe is about 6,300 ft. No. 2 pump in each station has a bottom horizontal discharge position to have the dump valve at the lowest elevation possible.

DorrClones For Desliming

An innovation is the use of cyclone classifiers for desliming and dewatering mill tailings prior to their transportation underground. Desliming at the concentrator is done by a 24-in. DorrClone discharging at 45% solid into two 24x20-ft. agitator tanks, while two other units of same size dewater the pumped tailings to 66% solids at the collar of the Brown Bear shaft.

The dewatered tailings flow from the DorrClones into a small feed tank, whence they are sent underground via a 6-in. wood-stave pipe. Branch lines taken off this pipe are 4-in. wood-stave pipes, to the ends of which are attached by special clamp the 2½-in. rubber hoses leading to the stopes to be filled.

Operation of the pump stations and safety units is automatic, and supervision of the system requires only one man. The control unit at the concentrator consists of a panel on which are mounted five indicating lights and a push button station "start-stop." The primary feature of this indicating panel is that as the starting sequence is progressing, one light after the other will come on. Should there be a shutdown of the system before all pump stations get into operation, the operator will know that the shutdown occurred at the station failing to light the panel lamp.

How Pumps Operate

Operating sequence of the system is as follows: First, the operator starts the seal water pump in station No. 1, with the seal water pressure switch setting in motion sand pump No. 1 and energizing a time delay relay, which, after time delay, starts up sand pump No. 2. Indicating lamp No. 1 on the panel board lights up.

Next, pump stations Nos. 2, 3, 4, and 5 are all started in sequence in the following manner. When the line pressure develops on the suction side of No. 1 sand pump in each of these stations, the high-level probe in the air chamber makes contact on a pressure switch which starts the seal water pump if the dump valve handle has been reset and the limit switch contact is closed. The seal water pressure switch then starts sand pump No. 1 in each station and energizes a timing relay which starts sand pump No. 2 after time delay, and providing sand pump No. 1 is on the line and operating.

Indicating lamps Nos. 2, 3, 4, and 5 light up in sequence and show that sand pumps in each station are operating. Dump valves must be reset, otherwise the system will not operate. Limit switches control this operation.

A master timing relay is provided to shut down the system if starting is not completed within a reasonable time limit. If any motor stops because of overload or other reason, the complete pumping system is shut down. This is done by interrupting the power supply to the dump valve solenoids, which causes all pumps to stop. The sand pumps used in the system are driven by 25-hp. motors.

Concentrator

The crushing plant and concentrator are a short distance from the 6,850 tunnel portal. Both buildings are of steel-frame construction, with the roofs and walls covered with corrugated iron sheets. Ore crushed to minus ¾-in. size in two stages in the crushing plant is transported to the 550-ton fine-ore bin at the head of the concentrator building by a long incline conveyor system consisting of two 20-in. belts 215 ft. and 264 ft. long, respectively.

Crushing plant and mill equipment was first turned over on June 5, 1951. Current operations are centered in milling dump ore and that obtained from development work. The material is oxidized to some extent and is more difficult to treat than regular mine production.

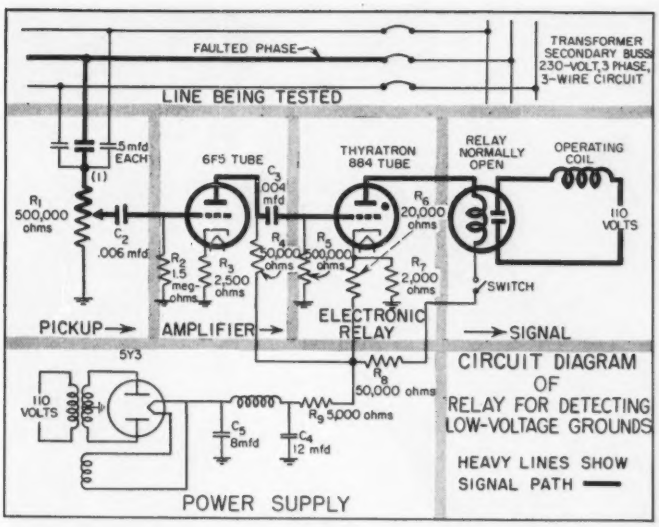
Regular mine ore sent to the concentrator will assay 1.50% copper and 0.70% cobalt. As in the mine, operations at the concentrator are still on a "breaking-in" and testing basis.

Lime Is Key

The flowsheet is based on more than two years of test work done in a pilot plant capable of handling 2,000 lb. of ore an hour. It was here the problem of successful selective cobalt flotation was worked out. Treatment of the ground pulp involves long conditioning with lime at 90 deg. F.

Reagent 208 floats copper at a pH of 10. Iron is floated with Z-6 and reagent 404. Sodium sulphide, then sulphuric acid, then more sodium sulphide plus Z-6 and pine oil are added to float cobalt. The pH is 4.0. Each concentrate is

(Continued on page 121)



How to Detect Low-Voltage Grounds As They Occur

A. B. CHAFETZ,
Plant Engineer
International Minerals
& Chemical Corp.
Carlsbad, New Mexico

Detecting a ground fault in electrical equipment is like detecting a cancer: the sooner the better.

Mr. Chafetz' relay is designed to detect ground faults when and as they occur. Each unit is small, inexpensive to build. Several of them can be installed, one at each substation or other key point, throughout a mine. Use of such detectors to find ground faults before they become dangerous should promote safety among operators of electrical machines.

MANY UNDERGROUND MINES of the West use a three-phase, three-wire, delta-connected, 230-volt, ac distribution system. Operators usually provide adequate protection against phase-to-phase faults, but give little attention to ground faults. Yet insulation failures in mining machines, equipment, and trailing cables, probably cause most electrical troubles on such low-voltage systems.

The simple device illustrated above is an automatic means for detecting ground faults in order to minimize hazard to the operators of 230-volt (and smaller voltage) equipment.

The fault-detector (see circuit diagram) may be described in general as an electronic relay in which an amplified control impulse is transferred to an electromechanical relay.

If a fault exists in any phase, the potential at (1) is shifted from neutral, and current flows to ground through potentiometer R_1. (When the detector is installed, R_1 is set at a sensitivity which satisfies local conditions.) The signal is then amplified in the 6F5 and, still too weak to operate a mechanical relay, it triggers the Thyratron tube into conductance. Current from the Thyratron closes the contacts of the normally open relay. For ground detection, an auxiliary relay may be placed in the relay circuit to sound an alarm or turn on a warning light. If circuit isolation is desired, the auxiliary relay can operate the shunt trip coil of the secondary low-voltage breaker.

Once it starts conducting, the Thyratron keeps the relay closed (and signaling) until an operator resets it by opening the switch.

For test purposes, the relay parts were mounted in a metal box 5-in. wide by 6-in. high by 8-in. long. All leads were brought through the front panel where the potentiometer adjustment dial was placed. It is anticipated that the entire equipment can be rubber-mounted in a much smaller box, in a rugged unit which would withstand jolting, if mounted on the frame of a portable substation.

The major advantages of the detector are these:

1) It is inexpensive to build.

2) It does not require a fourth wire in the distribution cable.

3) Signal operation may be obtained to suit local conditions. The degree of sensitivity can be easily determined by experience.

4) The unit has a wide range of sensitivity. Tests indicate signal operation for impedances from dead short to 200,000 ohms. (In most instances, cable resistance was regarded as being negligible compared to ground resistance.)

The relay is not intended as a cure-all for the problem of equipment grounds on three-wire, three-phase, delta-connected, ac systems. Rather, its use should be limited to systems whose phase voltage does not exceed 230. Although a test was made successfully on a three-wire 440-volt system, the detector's use for circuit-breaker operation on such systems is not advocated, because the installation of the relay does not provide a means of reducing potential to ground at the faulted machine. Yet local conditions may alter the conclusion. For, if the area of operation has sufficiently high resistance, the momentary high potential to ground may not be objectionable.

Because of the wide variation in ground resistance underground at International's potash mine at Carlsbad (from 200 ohms to 10 megohms), and because ground resistance decreases with time, it is anticipated that the electronic detector will be used only on the 230-volt secondary power systems.

ACKNOWLEDGMENT

The author expresses his appreciation to Mr. Roy Call of the Westinghouse Electric Corp. for his help in initiating the idea; to Mr. Paul Livin of International's electrical department, for valuable suggestions and help in producing and testing the finished relay; and to management of the potash division for permitting the publication of this information.

Uneven ground at site was turned to advantage in . . .

Laying Out Surface Plant for Mather "B" Shaft

ADVANTAGES: (1) Change house, shops and warehouse are connected by tunnels to the shaft, giving easy access for men, equipment and supplies, especially in winter. (2) Height of steel headframe has been held to 100 ft. 6 in., in contrast to almost 200 ft. at Mather "A" shaft, where the site was level.

HARRY C. SWANSON

Assistant Superintendent in charge of operation at Mather "B" Mine Shaft
Negaunee Mine Co.,
Negaunee, Mich.

IN SURFACE ARRANGEMENT and equipment, as in the actual sinking operation, Negaunee Mine Co.'s new Mather "B" shaft, on the Marquette iron range, merits the attention that its twin Mather "A" shaft has received since it was sunk and equipped more than 10 years ago.[1]

The company's Mather mine, which has been opened by the two shafts, embraces nearly 2 sq. mi. of ground within the limits of the cities of Negaunee and Ishpeming, in Michigan's Upper Peninsula. The Negaunee company is managed by Cleveland-Cliffs Iron Co., which, jointly with Bethlehem Steel Co., owns the Negaunee Mine Co. stock.

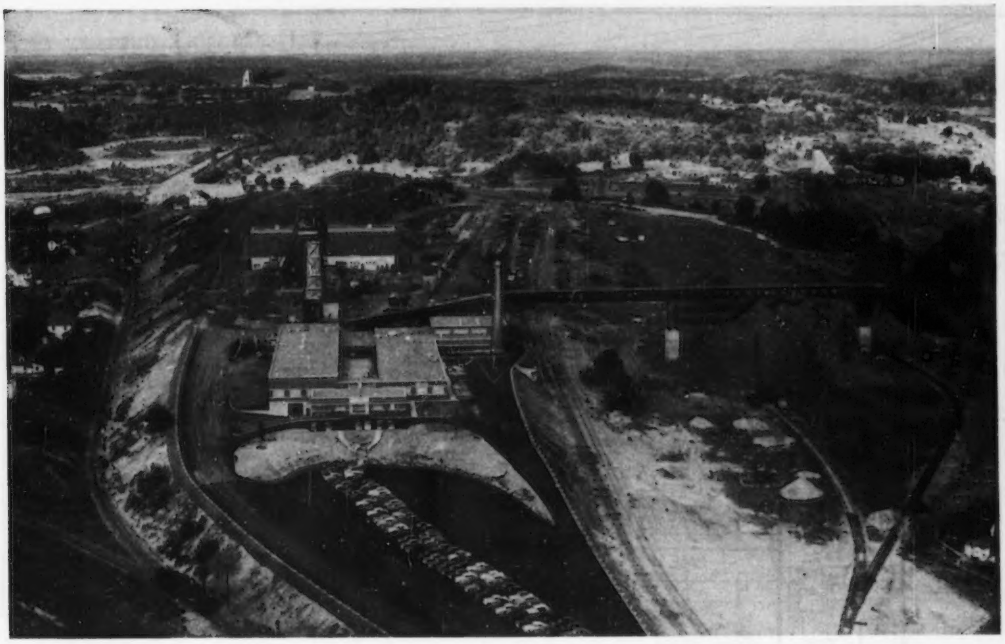
After Mather "A" shaft had been sunk by the Negaunee company to an initial depth of 2,352 ft. in early 1943, and a shaft capacity of over 1 million long tons of iron ore yearly, realized by orderly development and mining, the sinking of the second shaft, the Mather "B," was started in accord with previous planning. Both shafts are vertical. Mather "B" was designed as a twin to Mather "A" shaft, and the sinking technique developed at Mather "A" was utilized and improved upon[2] in "B" shaft operations.

Surface Layout Presented Three-Dimensional Problems

The permanent buildings for Mather "B" shaft were under construction and the equipment was

[1] The opening of the Mather mine was described by C. W. Allen and L. C. Moore, in the *Transactions* of the AIME (T.P. 1781A), 1945, and by A. H. Hubbell in *E & M J*, October, 1941.

[2] Sinking with the Hydro-mucker at Mather "B" was described by J. S. Westwater, at the San Francisco Meeting of the AIME, February, 1949.



COMPARE THIS VIEW of surface plant at Mather "B" shaft and nearer view on opposite page with plan and elevation drawings on pages 84 and 85. Stockpiling conveyor, in center and right middleground, for year-round operation, is first of its kind in Iron Country, where winter stockpiling has long been done by larry car and trestle. A branch is being added for stocking ore laterally. Conveyor belt itself is first installation using twisted-return run. The property comprises 2 sq. mi. In distance, arrow points to Mather "A" shaft, more than 8,000 ft. away.

installed while sinking was going on. Due to the uneven, rugged terrain at the site of the mine plant and the shaft, some three-dimensional problems were presented by the general layout of the buildings and the selection of the proper elevation for them. A tour of the property after completion demonstrates that considerable study must have been necessary to obtain the final results. However, the unevenness of the ground proved an asset rather than an obstacle.

The foundations for the engine house and its equipment were poured on solid rock. The equipment includes two Nordberg hoists, each with two drums of 12-ft. diameter and an 8-ft. face. The cage hoist is powered by one, and the skip hoist by two 1,500-hp. dc motors, made by Westinghouse. Direct current for the skip hoist is supplied through a Westinghouse motor-generator set made up by a 2,500-hp. induction motor, a 90-ton flywheel, and two generators. That for the cage hoist comes from a motor-generator set driven by a 1,250-hp. synchronous motor.

Two Ingersoll-Rand P.R.E. compressors have been installed, with space and provision for two additional similar installations.

The shops and dry buildings, patterned after those at Mather "A" shaft, are of brick construction with salt-glazed-tile interiors. The various shops are laid out adjacent to the warehouse, so that supplies can be passed to shop men directly through wickets or windows by the warehouse attendant. The supplies intended for each shop are kept in the part of the warehouse opposite that shop. This minimizes "legwork" for the warehouseman and the shop employees.

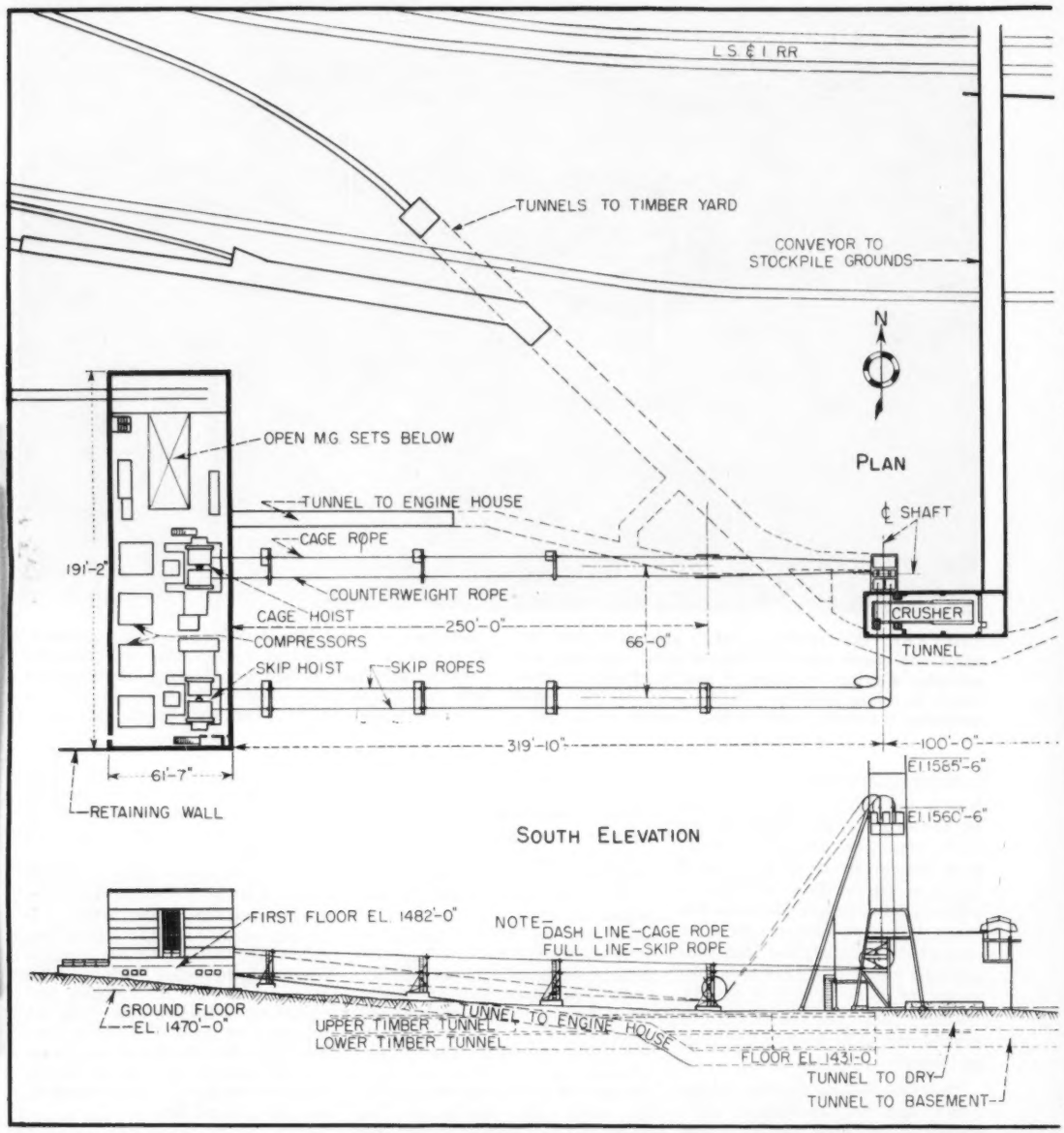
All the shops are connected to the shaft by a concrete tunnel which permits track-haulage of underground equipment to surface for repair and back again without exposure to outdoor weather. This is an advantage, especially during cold winter months. Both the dry building and the shop wing have basement areas which are also connected directly to the shaft by underground concrete tunnels for narrow-gage haulage. The basements are used to store repaired and new equipment, mainly scraper hoists, loaders, ventilation fans, and similar items.

The buildings as laid out include also a modern, well-equipped mine-rescue training station, where volunteers from all Cleveland-Cliffs mines are trained to use oxygen-breathing apparatus. Training work is carried on in underground concrete tunnels leading away from the basement of the station. Smoke and gases can be introduced into these tunnels during training periods to simulate conditions encountered in an underground fire.

Lower Headframe Permitted By Several Factors

At the time Mather "A" shaft was in the planning and construction stages, it was necessary to provide for a headframe nearly 200 ft. high to maintain a trestle height of 60 ft., in order to stockpile the iron ore and allow for skip dumps and for screening and crushing the ore. At Mather "B," however, advantage was taken of the rugged

Layout of Surface Plant at Mather "B" Shaft.



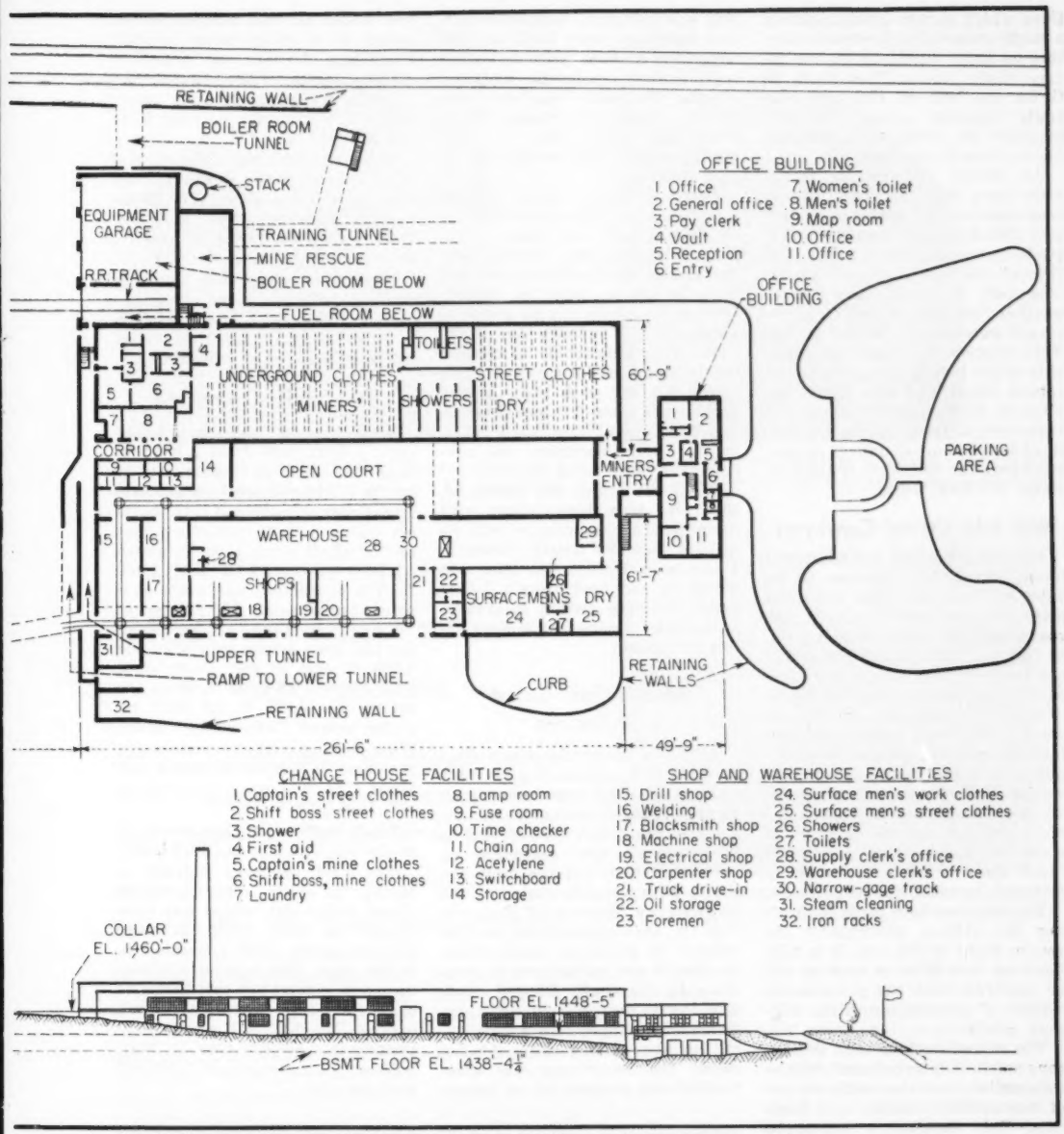
COMPARE THIS DRAWING with photographs on pages 82 and 83. Note the differences of elevation at bottom and the

terrain to reduce the height of the headframe. Installation of a stocking and loading conveyor belt from the headframe to the loading pockets and stockpiling area also favored building a lower headframe.

To permit handling the same type of skip as those used at Mather "A" shaft, the Mather "B" headframe is only 100 ft. 6 in. high from collar to centerline of sheaves on the sheave deck. Through a unique turnsheave arrangement on the south side of the headframe for the skip-hoist ropes, it was also possible to place all the top sheaves on one sheave deck. This was also a factor in reducing the height of the headframe structure. It also permits easy replacement of any sheave by means of the trolley beams above the top deck.

Equipment in the headframe includes two 72-in. heavy-duty Kennedy Van Saun pan feeders, one 15 ft. long and the other 21 ft. long; also a 5x12-ft. Model "D" Simplicity scalping screen and a 36x24-in. Allis-Chalmers Superior crusher.

The ore is hoisted by two 223-cu. ft. skips which dump into a hopper or bin located over the 72-in.x21-ft. pan feeder. This directs a flow of



tunnels that have been provided linking shaft and buildings in both elevation and plan.

ore over the 5x12-ft. screen which discharges the oversize into the jaw crusher. Ore that passes through the screen is picked up by the 72-in.x15-ft. pan feeder. This shorter feeder supplies the 48-in. conveyor with a bed of fine ore to cushion the crushed material from the Allis-Chalmers' jaw crusher.

The 48-in. belt conveyor, 55 ft. long, which is located beneath the crusher building equipment, discharges onto the stocking conveyor, which is 36 in. wide.

Stockpiling Belt Has Twisted Return

Past practice at all underground mines in the Lake Superior District has been to stockpile the ore produced during winter months by means of larry cars operating on trestles from headframe to stockpile grounds, or by means of trucks. Although belt conveyors have been used to a great extent in the open pits and in some underground operations, the sticky, wet characteristics of iron ore have kept most mines from using belt installations on surface for winter operation. One of the worst condi-

tions which occurs when handling a sticky material is produced when this material builds up on the return flight idlers. This tends to throw the belt off line and also spills material along the full length of the installation, presenting a cleanup problem.

At Mather "B," on the initial main 36-in. belt, this condition has been overcome by turning the belt over 180 deg. immediately after it passes over the head pulley and through the vertical gravity takeup. The belt is again turned over another 180 deg. immediately before it passes over the tail pulley. This procedure places the clean side of the belt in contact with the return idlers and also limits the cleanup to two points along the installation. These points are confined to the short distances required to turn the belt. This is about 11 times the belt width.

Will Add Lateral Conveyors

Present plans call for additional lateral stockpile conveyors to be extended east and west from the main 36-in conveyor.[3] A simple railroad pocket for direct shipping will be installed between the headframe and stockpile area. A traveling Link-Belt tripper moving the full length of the horizontal portion of the conveyor gallery will permit dumping into the railroad pockets or stockpiling on either of the lateral conveyors. Galleries or enclosures for all the conveyors are constructed of a treated outside corrugated sheet and a galvanized corrugated inside sheet with 2 in. of insulating material between the two sheets.

Provision has been made for heating the gallery, particularly the return flight of the belt. It is felt, however, that little or no heat will be required, with the possible exception of spot-heating at the tripping points.

The cost of stocking with this arrangement, it is anticipated, will be substantially less than with the use of conventional trestles and larry cars. This comparison cannot be made until sometime in the future.

Carbide Drilling, Mechanical Mucking, in Shaft

On starting to sink Mather "B" shaft early in 1947, the overburden, about 16 ft. deep, was cleared away from the site by a bulldozer. Sinking in rock to a depth of 87 ft., by way of collaring the shaft, was completed the same spring. While this was going on, temporary surface buildings were built and the temporary sinking hoist and other engine-house equipment installed.

After the collar had been concreted, a temporary wooden headframe was erected over the shaft mouth. Actual shaft sinking began that October.

Using a 72-hole round, drilling was done with 10 Ingersoll-Rand J-50 sinkers, and 1-in. quarter-octagon, Bethlehem high-carbon steel. For several months the Jackbit was used in 2¼-in. gage as starter. Drilling time with this bit averaged about 4¼ hrs. Introduction of the Carset tungsten-carbide bit reduced the drilling time for a round to two hours. Bit life with the standard Jackbit was about 2 ft. per sharpening. The Carset bit produced 135 ft. before being discarded, the predominant cause being gage loss.

When the round was completed, the holes were blown clean with compressed air and charged with 80 to 90% Hercules Gelatin Extra in 1¼x8-in. cartridges. The blast was wired up and fired from a locked safety blasting switch located in a concrete service tunnel just below the collar.

Muckers First Tested On Surface

Although the mucking was done by hand at the beginning of shaft sinking, plans and experiments with various types of mechanical shaft-mucking equipment were carried on in five shaft sets, assembled on surface a short distance from the shaft. With the cooperation of the Hydro-crane Division of Bucyrus-Erie Co., the Hydro-mucker was developed. It proved a success from the time it was put to work in operation in the shaft. Blasted muck was loaded into a 2-cu. yd. tray, which was dumped into a 2-cu. yd. car on the sinking cage. At the collar, the loaded car was side-tracked and replaced by an empty. The loaded car was dumped into a pocket by a rotary dump nearby. From here the rock was hauled to various points on the property by a Euclid truck and used for grading stockpile areas, parking lots, and like places.

After mucking was finished, the miners installed the steel shaft set fabricated from 6-in. WF 25-lb. beams. These sets were hung on 7 ft. centers by means of 6x6x½-in. corner studdles.

With the carbide bits and the mucker, sinking speed was increased. The shaft was bottomed at 3,093 ft. in August, 1949, about five months ahead of schedule.

Two Shafts Connected

While the "B" shaft was being sunk, a drift crew drove a heading from "A" shaft to connect with it on the 6th level 2,200 ft. below surface. Collar elevations of both shafts are within 3 ft. of each other, that of "A" shaft being 1,463 ft. above sea level and that of "B" shaft 1,460 ft. The connection was made at a point approximately 500 ft. west of "B" shaft, after the "A" shaft heading had been driven approximately 8,300 ft. east of "A" shaft, or a total distance of 8,800 ft. along the drifts. The 8,800 ft. of drift included several 75-ft. radius curves. When the final connection was made, the error in horizontal control was about 1 ft. The error in elevation was less than ⅒ ft.

Shaft stations or plats were cut on the 6th, 7th, 8th, and 10th levels.

The first ore was hoisted at Mather "B" shaft during Cleveland-Cliffs' centennial, which was celebrated in June, 1950. Tonnage hoisted during 1950 amounted to 48,000 tons. The mining methods in use to extract the soft hematite ore are sub-level stoping and block caving. The shaft will produce approximately 500,000 tons in 1951, with an ultimate goal of 1,500,000 tons per year.

[3] One of the east extensions is now being erected.

Now is the time to sell your scrap ! ! !

Q: Why?

A: 1. You'll get a top price today.

2. Today, because of the metals shortage, the scrap you sell won't lower the price of new metals—metals you are mining. Later on, it may.

3. The country needs it.

Q: What kind of scrap?

A: Scrap of nearly all metals and alloys.

Sandblasting must be uniform and of proper degree

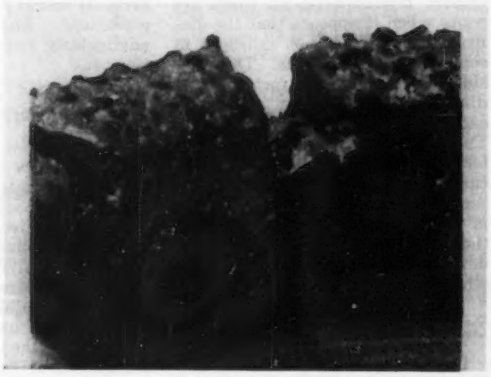
SANDBLASTING INSUFFICIENT. Diamonds do not have essential clearance. Result is a poor rate of penetration.

SANDBLASTING EXCESSIVE. Diamonds are exposed too much, may be broken, and in extreme cases, knocked off.

How To Use Diamond-Impregnated Coring Bits

Where reconditioned by proper degree of sandblasting, they offer many advantages, especially for the foreign field.

KARL J. KLAPKA, Wheel Trueing Tool Co., Detroit, Mich.



THIS AREA IS OVER-SANDBLASTED. Drilling fluid is allowed to bypass, other portions are insufficiently flushed.

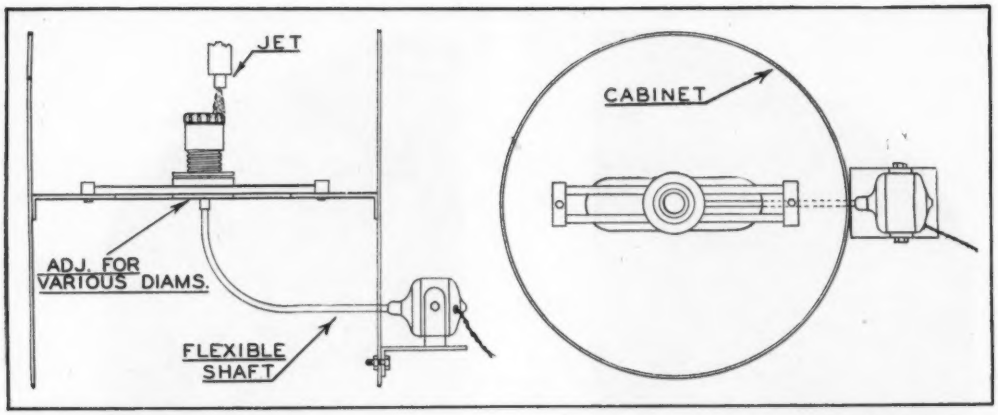
DIAMOND-IMPREGNATED coring bits have become an important factor in hard-rock drilling in numerous mining areas. As research continued in an effort to develop more efficient surface-set bits, impregnated bits were likewise tested and modified to a degree where the economics of drilling programs now demand their use in many instances.

In general there are two classes of diamond bits on the market: the surface-set and the impregnated. As the names imply, the first type is one in which a single layer of diamonds protrude from the crown, or lead surface of the bit, in a predetermined oriented pattern. In the impregnated bit the diamonds are uniformly distributed throughout the entire metal matrix crown in such a manner that, as the crown is worn away, each successive layer of diamond distribution is exposed to serve as the cutting medium.

The impregnated matrix which bonds the diamonds together must be an extremely tough and abrasion-resistant metal. For this reason metals approaching the general classification of tungsten carbides are used. It can, therefore, be easily understood that as the diamonds wear away or are broken off, thereby affecting the predetermined exposure, the drilling rate of penetration becomes poor. Only under the most unusual adverse drilling conditions has it been noted that the matrix will wear away when the diamonds are worn flush. To expose the diamonds again to obtain suitable cutting performance, the face of the bit must be sandblasted.

To achieve economical performance from impregnated bits, the theory of proper sandblasting must be taken into consideration because the diamonds must be sufficiently exposed to obtain satisfactory cutting action. Insufficient sandblasting will not give the diamonds their essential clearance. Mudding (caking of the cuttings over the face of the bit) will take place and inadvertently cause excessive diamond wear and a poor rate of penetration. Over-sandblasting also has a deleterious effect on the bit. Excessive exposure would allow considerable diamond breakage and in extreme cases the diamond could be knocked off the matrix. This could result in rapid breakdown and shorter bit

A contribution of the Diamond Core Drill Manufacturers Association.



UNIFORM SANDBLASTING can be secured by use of jigs such as these, which rotate bit at uniform rate

life wherein the full value contained would not be utilized economically.

In visual examination of a sandblasted impregnated bit there are times when it appears that the diamond clearance is not sufficient in some parts or segments. This illusion is caused by the fact that the diamond impregnation varies in each plane as the bit is worn away. This is a frequent fault in the sandblasting of impregnated bits and care must be taken not to oversandblast any particular area. It is detrimental because it allows the drilling fluid to bypass and cuts down the flushing action in the other portions of the bit.

Jigs for Uniform Sandblasting

Important as it is to maintain the proper exposure of the diamonds on the face, it is even more important not to sandblast the ID or OD of the diamond impregnated core bits. It has been found that to maintain ID and OD gage, the matrix metal must encompass the diamond solidly. Many of the operators now using impregnated bits, realizing the importance of uniform sandblasting, are utilizing various jigs to accomplish this purpose.

Jigs for sandblasting are nothing more than small revolving devices, either hand or mechanically driven, which rotate the bit at a uniform rate. Thus the matrix is abraded uniformly as the face of the bit travels under the nozzle in the sandblaster. To protect the critical ID surface from the blast a rubber plug or snug-fitting piece of hose is placed inside the bit.

Since all operators of diamond drill rigs are interested primarily in the efficiency and economy of any piece of equipment, it is in their best interest to see that it is used properly and kept in good operating condition. The impregnated bit particularly merits this consideration.

Use Proper Abrasive

It is essential to use the proper abrasive when sandblasting diamond-impregnated bits. Through continued use it has been determined that silicon-carbide abrasive in the 40-80 mesh-size range performs most satisfactorily. When a smaller grit size is used, it takes too long to sandblast each bit. When larger grit is used, there is rapid abrasion of the matrix; more important, there is also considerable breakage of the diamonds to an extent that the bit can be worn away without ever having achieved the sharp cutting that is obtained with reasonable exposure and correct sandblasting procedure.

For all general purposes it has been found than an air pressure of approximately 80 lb. through 7/32-in. nozzle gives sufficient cutting action over a wide enough area to sandblast impregnated bits rapidly. The normal time required to sandblast bits of standard mining size is as follows:

Size	*Time, Seconds*
EX	10-15
AX	15-20
BX	20-30
NX	30-40

These times may vary with air pressure and as the abrasive becomes worn through reuse. Silicon-carbide abrasive caught in the collecting system may be reused several times. However, as it wears down in size and the sharp edges are rounded off, it will take longer to sandblast. When this condition occurs, the entire system should be cleaned out and reloaded with new abrasive.

The reader should not jump to the conclusion from the foregoing that the impregnated bit is a tool of precision and delicate. This is far from the truth. The impregnated bit will stand abuse over and above anything possible with a surface-set bit. Where the economics are equal, the advantages in its use are numerous.

Advantages of Impregnated Bit

Impregnated core bits perform economically in many formations and show real merit in extremely hard, broken, or vuggy sections. Collaring a hole with a surface-set bit presents a problem in that it subjects the bit to abnormal use. Here the impregnated bit takes this operation in stride. In one case where surface-set bits were used for collaring holes in badly broken ground, over 75% of the original value of the bit was expended. By subsequently using impregnated bits it was found that several holes could be collared before the bit began to show abnormal wear. This alone would be a place for a saving to the diamond-drill operator.

Two-Fold Advantages Abroad

Foreign operations have found the advantages of the impregnated core bit to be two-fold. Primarily the quality of labor available is not as high in many cases as could be desired. Diamond-bit cost per foot

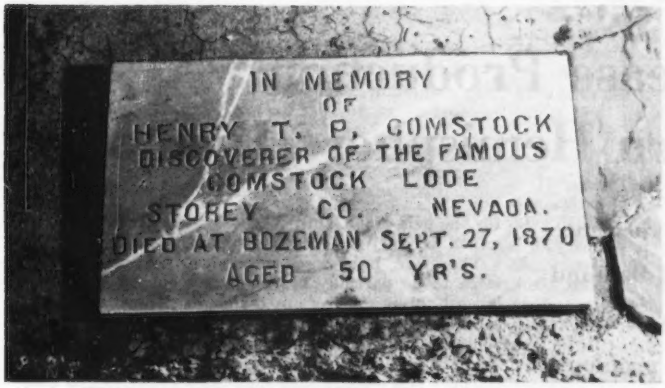
is relatively high due to poor operating techniques employed by native drillers. Here the impregnated bit does a good job whether abused or not. After use it can be sandblasted and sent right back to the rig.

Second, surface-set bits must be returned to the manufacturer for resetting. This entails broker fees, import and export licenses and additional shipping charges. In many countries this is not only difficult but in some cases is not allowed. In the case of impregnated bits, they are used until worn out and are then thrown away. What could be simpler in foreign operations? No round robin of bit orders and returns must be kept up with its attendant paper work. Consequently, a smaller inventory of bits is required.

Little Difference in Penetration

In tests run on impregnated core bits to determine the rate of penetration as compared with surface-set bits, it was found in the majority of cases that there was not too much difference. In broken ground the penetration was about equal. In solid ground the impregnated bit cut more slowly. In hard, broken formations, even though much of the core was ground up due to blocking, little or no ID wear was apparent after many runs. This in itself is another good feature.

The advantages of impregnated bits in hard-rock drilling are increasing through recent developments and the scope of their use broadens continually. It will soon be the equivalent of carrying insurance for all drilling rigs to have a few impregnated bits on hand in case the formation conditions are such that the cost per foot of surface-set bits becomes excessive in certain sections of the hole. This is even now becoming the case on the Michigan and Minnesota iron ranges where hole conditions go to extremes.



THE SLAB OF MARBLE, in memory of Comstock, lies flat, resting on a base of concrete that projects a little above the surrounding grass.

Journey's End for the Comstock's Founder

A. W. SCHLECHTEN
Dept. of Metallurgy
Mo. School of Mines & Metallurgy

THE PEACEFUL, well-kept cemetery on the hill east of Bozeman, Mont., seems hardly appropriate as the final resting place for such a tempestuous character. A simple marble slab on a low, flat, crumbing concrete base reads—"In Memory of Henry T. P. Comstock, Discoverer of the Famous Comstock Lode."

Comstock's boastful claim is thus preserved for future generations, and the identity of the true discoverers of the famous bonanza becomes even more obscure. The gravestone gives no other hint of Comstock's erratic career which finally ended in suicide on the main street of this little Montana town.

According to the historians, Comstock was a tall, gaunt Canadian who had been a fur trader, trapper, and prospector with little success. In June, 1859, he visited the diggings of Patrick McLaughlin and Peter O'Riley on the steep side of Sun Peak, in what became the Gold Hill district of Nevada. Recognizing the signs of a rich find, Comstock claimed that the prospectors were trespassing on his ranch claim of 160 acres. They took him in as a partner and subsequently Comstock filed a mining claim on what eventually turned out to be one of the richest parts of the lode.

Evidently Comstock made no serious attempt to develop his mining claim and spent his time in loafing and boasting. Dan DeQuille in his book, "Big Bonanza," describes Comstock as making himself so conspicuous on every occasion that he soon came to be considered not only the discoverer but almost the father of the now famous Comstock Lode.

In a deed signed Aug. 12, 1859, Comstock sold his mining interests to James Walsh for 10 dollars in hand and 10,990 dollars to be paid at a later date. The second payment was made by Walsh with no objection when he found out how rich the assays were on the ore taken from the claim.

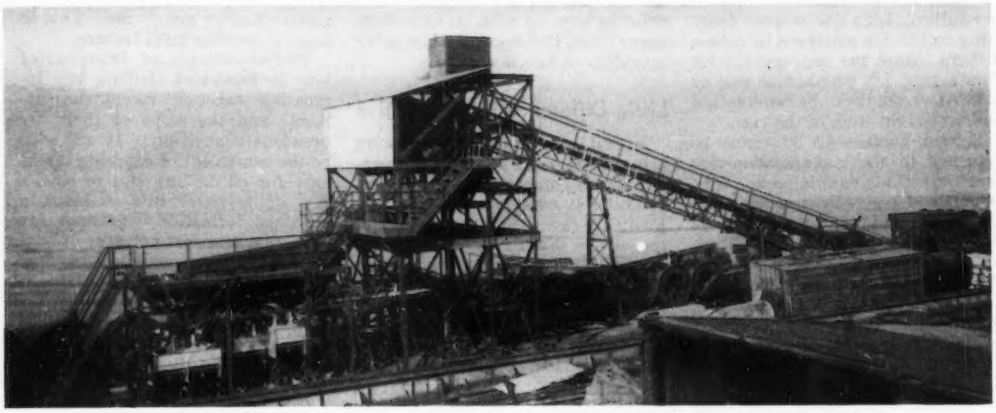
During the following years, Comstock opened supply stores in Carson City and Silver City which were failures, leaving him bankrupt. He then returned to prospecting and wandered from camp to camp in Idaho and Montana hoping to find a second lode.

In 1870 Comstock joined with about seventy other prospectors with the intention of prospecting the Yellowstone country; this group was known as the First Big Horn Exploring Party. They disbanded in Bozeman without accomplishing their purpose and Comstock was left stranded.

Evidently he was laboring under delusions at this time and was by no means well-balanced. On Sept. 27, 1870, he shot himself in the head with a revolver. It is said that he practiced for a while, shooting at a mark before turning the gun upon himself.

For some years the grave was unmarked until the present slab was provided by Nelson Story, Sr., of Bozeman. Story was a prominent citizen of Bozeman and the Gallatin Valley; he had obtained his start in the gold mining camp of Virginia City, Mont.

Very few people see the marker above Comstock's grave, or know much about the man who was Comstock, but by an accident of Fate his name will be preserved long after the memory of more deserving men has disappeared completely.



MECHANIZED WASHING of diamond gravels may recover 40% more than hand methods.

How To Increase Production Of Western Hemisphere Diamonds

From his long and varied experience in the finding and mining of diamond gravels, Mr. Michael draws an interesting solution to a supply problem.

R. W. MICHAEL, Consulting Engineer, New York, N. Y.

WHAT HAPPENS TO DEMAND for industrial diamonds during a period of intensive military production is shown in Table I. In brief, if the war years may be taken as a criterion, U.S. consumption of industrial diamonds at such times runs well beyond supply.

It is of even greater interest to note that in the period covered by the table, the United States consumed 97.1% of the concurrent world mine output of diamonds, 85.38% of it for industrial use, and 14.62% for the gem trade. Only 3.19% of this production was mined in the Western Hemisphere.

Table I—U. S. Diamond Consumption Outran World Output In Wartime

Year	U. S. Consumption, carats — Gem	Industrial	Total	World Output Carats
1942	654,674	12,203,704	12,858,378	9,260,871
1943	1,481,026	12,172,025	13,653,051	8,347,239
1944	1,232,443	12,614,507	13,846,950	11,676,578
1945	1,618,793	10,729,869	12,348,662	14,257,157
1946	2,253,793	4,625,282	6,879,075	10,212,573
1947	1,771,098	4,035,004	5,806,102	9,754,231
1948	1,687,352	6,052,506	7,739,858	11,859,200
			73,132,076	75,367,849

Therefore, if by some mischance the United States were to be partially or completely cut off from the largest foreign sources of diamonds, it appears Western Hemisphere sources in their present state of development would be inadequate to handle even a substantial portion of the demand that would exist.

There is a popular idea that there are in hiding vast reserves of diamonds already mined and waiting to be thrown on the market as the owners of them see fit. The figures of Table I clearly indicate that this idea is pretty much of a myth.

It is true that there are vast reserves of diamonds in both hemispheres, but they are still in the ground, yet to be discovered and sampled. In the light of the foregoing situation, it would seem that there exists a powerful incentive for U. S. capital to explore for new diamond deposits in the Western Hemisphere and to expand the production from those already known.

The mining and subsequent recovery of diamonds, although it may seem romantic and mystifying to the layman, is actually a realistic business based upon the most modern techniques of mining and concentration practice. At least, it is in South Africa.

Not so on our side of the world! The poor showing of the Western Hemisphere in diamond output arises from no lack of diamond deposits. It is due in large part to the fact that all of this meagre production is the result of manual labor expended in primitive operations that depend wholly upon chance and that support their proprietors in most cases on a bare subsistence level.

What is needed is first, a systematic and careful exploration of areas where diamonds are being mined by hand methods. The aim would be to turn up ground too low-grade to work by hand but high enough in grade to support a mechanized operation. Second, mechanical, high-capacity methods must be applied to such deposits.

The problems in mining diamonds are generally much the same as those met in any other type of alluvial mining. The approach does require a special focus, however, in the very small size, very great value, and only moderately high specific gravity of the diamond product that is sought.

Profitable diamond gravel would run something like this: If the gravel weighs 125 lb. per cu. ft., and if the gravel has, as it should, about 0.5 carat per cu.m., the ratio of diamonds to gravel will be about 1 to 20 million by weight. Comparing equal weights of diamonds and gold, we find that diamonds in the rough have about 111 times the value of gold.

From the practical operator's point of view, an 8-hr. run for an 8-ft. diameter unit would be a cube of gravel 13.9 ft. on a side. The diamonds for such a run, assuming 0.5-carat gravel, would occupy a space of less than 0.5 cu. in. It is apparent from this that special mining methods must be used, and that the washing plant must be self-purging. Hang-up of quantities of material as small as 0.5 cu. in. would be a serious matter. Measures must also be taken to prevent theft.

The objective normally achieved in diamond washing operations is complete recovery of all stones above 0.25 carats (a cube of about 2.5 m.m.). Actually a recovery of more than 98% of all sizes of stones is possible.

It is not the purpose here to discuss the methods of proper exploration for diamonds, but one idea connected with it should be stressed. Many well-intentioned diamond exploration projects have failed because of the mistaken idea that diamond prospecting can be made to pay its own cost. Even when mechanized to the highest degree, unit costs of exploration are certain to be very much higher than can be obtained in subsequent production from the area. one can expect the diamonds recovered in prospecting to contribute no more than 1.5% to 4% of the cost of the work.

Clean-Up Jig Developed

In an effort to speed up the work of sampling diamond gravels I have devised an improved Plietz-type jig, which requires less than ½ hp. and can be operated mechanically or manually. It is economical in use of water, and therefore well suited to use in arid regions.

The jig is somewhat similar to the Schiechel circular jig, as developed in South Africa. It is described on page 11-33 of Taggart's *Handbook of Mineral Dressing.*

In the improved design, feed enters a conical hopper from which it is discharged by a simple feeding device onto the center of a circular screen. Suitable linkages permit vibrating this screen up and down to provide the required jigging motion. All the diamonds gravitate to the center of the screen and pass through holes placed in the screen at that point. Tailing overflows around the periphery and is removed by bucket elevator.

The central holes are closed by wooden balls of slightly larger diameter. Each ball is connected by a short wire through the hole to a similar ball below the screen. As the screen vibrates, the balls rise momentarily and allow concentrate to pass through the holes.

For clean-up work, a screen without holes is substituted. After jigging long enough to collect the diamonds in a central core on the screen, the screen is removed and the contents dumped on a canvas-covered sand table. Most of the diamonds are then immediately visible and recoverable. The remaining concentrate can then be cleanly cut away from the tailing and transferred to a pan for a thorough inspection and clean-up.

In rounded gravels, this jig has the relatively high capacity of 1 cu.m. per hour on classified feed. Gravel should be broken down into these sizes before jigging: minus 12, plus 6 mm.; minus 6, plus 3 mm.; minus 3, plus 1 mm. Diamonds ranging from 0.015 carats to 17 carats can be recovered as a hutch product. Larger sizes are recovered directly from the screen.

The same objectives of increased production and maximum recovery of diamonds have already been sought in a mechanized diamond washing plant, which I designed recently for construction by the New York Engineering Co.

The plant, which appears in the photograph, was designed to be a semi-portable unit, which could easily be moved from point to point in the diamond fields, but which would provide high capacity and high recovery.

From an inclined feed conveyor, gravel goes into washing pans that concentrate the gravel and eliminate 98% of the feed as a barren tailing. The remaining 2%, containing all the diamonds, then goes into a trommel screen that produces sized feeds for four Harz-type jigs. These jigs are made out of aluminum in order to save weight.

Clean-up of the final concentrate can be made on grease tables if desired, or in the smaller jig of the Plietz type already described.

New Plant Is Tested

This machine was tested in actual diamond mining operations in the Gran Sabana area of Venezuela. An idea can thus be gained as to its potentialities.

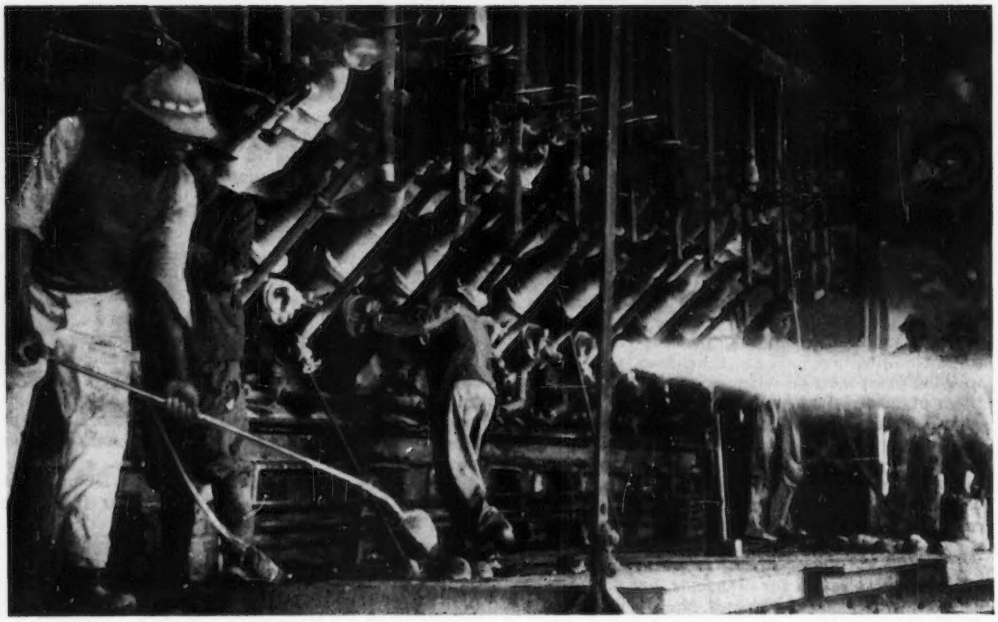
Before the unit was installed, a test buying program was carried on in the area to be worked to find out what size and quantity of diamonds were recoverable there by hand methods. The size was found to average 3.13 stones per carat. A calculation based on the size and quantity of stones subsequently recovered by the machine in that area indicates that hand methods on the same gravel worked by the machine would have yielded 4,710 stones weighing 1,472 carats, an average size of 3.19 stones per carat.

The machine actually recovered, in four months of operation, 28,135 stones for a total of 2,362.36 carats, or 11.91 stones per carat. This means that if hand methods had been used, there would have been lost a total of about 23,443 stones, or a total of 890 carats, averaging 26.30 stones per carat. Actually the machine is entitled to full credit for everything recovered, inasmuch as ground this low-grade would not normally have supported a hand operation.

Applying these ratios to other mining areas in Venezuela now being worked by hand, it becomes apparent that substantial increases in recovery could be made by mechanized gravel washing. Such increases might amount to as much as 40% or more.

A study of the 1950 diamond production of Venezuela indicates that the physical work involved could have been performed by six mechanized washing units plus 250 men, instead of the 2,500 men actually engaged in production. Or by putting more units to work the total production could be expanded enormously. The benefit to the diamond supply problem is obvious.

The Roraima sediments, remnants of which are from 3,000 to 6,000 ft. in thickness, affect the diamond potential of three countries, Venezuela, Northern Brazil, and British Guiana. In British Guiana, which has already produced close to 3-million carats by primitive work, I am convinced that the hope of developing commercial deposits with a tenor of 0.5 carats per cu.yd. is truly conservative and reasonable.



SMELTING EQUIPMENT at Lubumbashi plant comprises four water-jacketed blast furnaces. Each is 25 by 4 ft. in cross-section at tuyères. Limited by production of sulphide ores, one furnace suffices for present copper output.

Katanga Is Well Equipped For Treating Its Diverse Ores

ELECTROLYTIC TANK ROOM in Jadotville-Shituru group of plants. Here are treated the concentrates of the oxidized ores for recovery of copper and cobalt. Annual production of refinery is approximately 100,000 metric tons.

Facilities for gravity concentration and flotation, smelting, leaching and electrolytic work are sufficient for its varied needs. Cobalt is an important constituent of its ores.

EDGAR B. SENGIER
Chairman, Executive Committee
Union Minière du Haut Katanga
Brussels, Belgium

THE SCATTERED LOCATION of our mines, the very diverse nature of their mineralization, and the varying importance of their reserves have resulted in the provision of facilities that are quite different in kind. Some mines have been equipped with washing units where ores are treated which are too poor to stand the expense of transportation to the concentrator and which are easily beneficiated on the spot. This is especially true in the case of the Kamoto and Ruwe mines. Large concentrators have been provided in our three principal mining centers: Jadotville-Panda, Kipushi and Kolwezi.

The Oxidized Ores

The Jadotville-Panda concentrator, long the sole supply source of cencentrates, comprises two concentration sections, one for gravity concentration and one for flotation of the gravity rejects. It was handling 50,000 to 60,000 tons of products per month, but has suspended operations on ores of this type since mid-1951, due to the exhaustion of oxidized ore reserves in the Central Group of mines.

The oxidized ores of the Western Group of mines are basically malachite, chrysocolla, and pseudo-malachite. Their extremely altered gangue, a result of the decomposition of the calcareous rocks and the dolomitic schists, is composed of argillaceous or silicious schists and of silicious rocks. The tests made at the Panda concentrator on the Western ores over a long period led to abandoning gravity concentration and to the use at Kolwezi of locally made palm oil for flotation. Sodium carbonate is used as a conditioning reagent, because of the hardness of the water used. This hardness would impede the useful effects of the addition of sodium silicate used to disperse the gangue. The flotation reagent originally used was imported oleic acid. Several tests, however, led to the adoption of an emulsion of hydrolyzed palm oil and of crude oil. Before these conditioning oils are added to the pulp, they pass through a "colloid mill" for dispersion, which increases their efficiency considerably. Following are figures for the concentration of the copper ores at Kolwezi.

Feed	7.24%	Cu
Concentrates	28.32%	Cu
Tails	1.68%	Cu

The Kolwezi concentrator, which is being enlarged, will have two stages of crushing, two grinding sections and two flotation sections. Capacity is 130,000 metric tons per month. This output is to be increased within a very short time.

It has already been pointed out that the ores of the Musonoi mine contain a certain percentage of cobalt in addition to copper. A few strata, which were rather rich (1 to 2% cobalt), are mined selectively. These ores, which are reduced in the electric furnaces of Jadotville-Panda, are previously enriched by separate campaigns in the Kolwezi concentrator. Each year part of the activity at the latter plant is devoted to this work.

The procedure described for copper minerals has proved suitable and efficient for the cobalt-bearing ores also, after a slight adjustment or adaptation. The data covering this work under present conditions are given in the following table:

Data on Kolwezi Concentration Cobalt Campaigns

Feed, Co	2.13%
Concentrates, Co..	8.14%
Tailings, Co	0.82%

To complete this outline of the concentration of the oxidized ores, we should say that a short time ago a washing unit was installed, which is able to treat 100,000 tons monthly of the clayey breccia from the Ruwe mine.

In this breccia the malachite occurs as free particles, large enough to yield a concentrate running 30 to 32% copper, starting with feed running 4 to 5% copper, after passing through blade mills once, as well as through hammer mills and screens. This concentrate is sent direct to the electrolytic plant.

In some of our deposits a small quantity of dolomitic and talc gangue minerals is associated with schist and silicious gangue minerals. For these the procedure described was found to be less efficient, because the dolomite and the talc float simultaneously with the copper oxides. The treatment of these ores is now the subject of research in our laboratories. It seems that a superficial sulphuration of the particles, by adding sodium sulph-hydrate, will lead to a satisfactory solution. Plant tests are being undertaken to confirm this.

The Sulphide Ores

When the Kipushi mine started to supply the Lubumbashi smelter with sulphide ores, the copper content was rather high and the accompanying blende was small enough in quantity to feed them direct to the furnaces. As mining deepened, the content of copper decreased and that of zinc increased, and we soon had to think of concentrating these ores. At present a small quantity of the ore treated, made up of mineralized calc-schists of copper and zinc, is poor enough in zinc to be treated by ordinary flotation. The latter is being done with the reagents usually employed; namely, xanthates and pine oil.

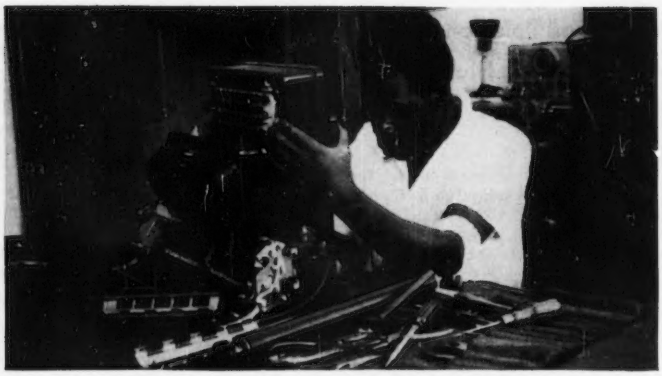
The ores having about 6.7% copper give 24% concentrates under these conditions, with a yield of about 95%.

The copper-zinc ores of a higher zinc content, mined at the rate of 70,000 tons per month, must be floated selectively to recover the copper and zinc separately. The ore mined consists of a mixture of copper and zinc sulphides, in a dolomitic gangue which is more or less silicified. The following is its composition:

Copper	11.00%	Zinc as oxide	1.50%
Zinc	19.00%	Silver	160g/t
Iron	7.0%	Silica	16.5%
Lead	1.0%	Alumina	5.0%
Sulphur	17.5%	Lime	5.70%
Copper as oxide	0.05%	Magnesia	5.0%

Separation of copper and zinc by flotation is usually done by the Sheridan-Griswold process. This process, however, does not give more than an imperfect result on our products. As a matter of fact, based on the depressing action of the sodium cyanide on the blende and the great floatability of the copper sulphides by xanthate, its efficiency is reduced for our ores as a result of the activation of the blende by the copper ions. This impedes the

Part I of this article, entitled "Katanga's Mineral Empire is Based on Many Metals," was published in the November, 1951, issue.



CAPABLE NATIVE WORKMEN are assigned to take instruction courses. They may thus qualify as mechanics, crane men, shovel operators, electricians, casters, or shopmen.

depressing action of the cyanide, on the one hand, while on the other hand its efficiency is reduced by the decrease in the floatability of the copper minerals.

A very large number of studies and laboratory tests has led to the process which is now employed in the concentrator at the Kipushi mine. The ores are crushed and then ground at 200 mesh. The sodium cyanide, for depressing the blende, is added in the ball mills, with addition of sodium sulphide which acts as a reducing agent to maintain the complete efficiency of the sodium cyanide. To the conditioned pulp are then added the collecting and frothing reagents, necessary for the primary flotation of the copper. This first operation gives a copper concentrate containing almost 68% of the copper in the feed and which runs 30% Cu.

The remaining pulp is then made alkaline and copper sulphate is added to reactivate the blende previously depressed. It is then subjected to a bulk flotation using ethyl xanthate. This gives another concentrate containing 40 to 45% zinc and 10% copper, including the rest of the economic minerals. This concentrate, reconditioned in a pulp of known pH with addition of ferrocyanide to depress the copper minerals, is subject to a final flotation the first stage of which gives a zinc concentrate running 53 to 55% zinc and 4.5% copper. The residues, analyzing 18 to 23% copper and 3 to 10% zinc, are added to the primary copper concentrate and sent to the plants after thickening and filtration.

Following are results, in condensed form, recently obtained at the Kipushi concentrator:

Selective Flotation

Feed	10.54% Cu, 20.94% Zn
Copper concentrates..	27.88% Cu, 11.48% Zn
Zinc concentrates	52.11% Zn, 5.40% Cu

The selective flotation of the sulphide ores and lixiviation of oxide ores has brought about the development in Katanga of a chemical industry which produces sulphuric acid, made from the gases obtained by roasting the Kipushi blende. This industry has made possible the great development of the hydrometallurgy, of which we will talk later.

Metallurgy

As said at the beginning of this note the varied character of the ores require for their concentration, as well as for their metallurgical treatment, the use of different methods, according to whether the metal is in sulphide form or oxide. In line with this statement, there are two groups of metallurgical plants to treat the products: one at Lubumbashi, near Elisabethville, which treats the sulphides, and the other at Jadotville-Shituru, which produces copper from the oxidized ores.

The Lubumbashi Smelter

The oldest of the metallurgical plants, that at Lubumbashi, was established for smelting the oxidized ores sorted out of the daily production before the concentrators were built. The plant was therefore equipped with water-jacketed furnaces. This type of furnace has been retained and today treats the sulphide ores of the Prince Leopold mine at Kipushi. Inasmuch as it is best suited for handling only materials in fairly large lumps and because the Kipushi copper concentrates are of fine size (the product of flotation), the reduction operation is preceded by agglomeration. This is done on three sintering machines, each 60 in. wide and 66 ft. long. Besides the agglomeration, these Dwight-Lloyd machines give a homogeneous product which favors speedy fusion in the furnace. Sintering also removes part of the sulphur, determining the grade of matte to be produced. Here also is where the products of different composition that are to enter the fusion zone of the blast furnace are first mixed so as to provide the best slagging conditions. Each machine produces 400 to 500 metric tons of sinter per day, ready for smelting.

Four Blast Furnaces

For smelting, the plant has four water-jacketed blast furnaces, each of 20x5-ft. cross-section at the tuyeres. A single one of these furnaces suffices under present conditions for reducing the ores submitted to treatment in the Lubumbashi plant whose tonnage is limited to that of sulphide ores produced.

As a result of the preparation of the charge, after agglomeration, the speed of fusion in the furnaces increases to 55-60 metric tons of charge per hour, with coke consumption at about 9% of the weight of charge. The conditions are most satisfactory, if one considers that the slag produced normally contains more than 20% of zinc oxide. The matte made in the blast furnace runs 60-65% copper. It is transferred to a reverberatory furnace heated with pulverized coal and of a capacity of 120 tons of liquid matte. From the reverberatory, the matte is delivered in 150-cu. ft. ladles to a 13x30-ft. Pierce-Smith converter equipped with fifty 2-in. tuyeres. The converter gives 55 to 65 tons of blister copper per operation, or an average daily output of 300 tons of copper in blister form. Under present operating conditions the converter lining is fit for the production of more than 27,000 tons of copper, before being replaced. In this way the Lubumbashi plant easily produces annually 72,000 tons of blister running 98.5% copper.

The products of the converter

are handled by ladles similar to those used for transporting the matte. These ladles pour the blister into a revolving cylindrical furnace 31.8 ft. long and 9.8 ft. in diameter in which it is kept liquid. The furnace is heated with pulverized coal. From this revolving furnace, the copper is poured onto a rectilinear casting machine capable of turning 20 to 25 tons of copper per hour into ingots.

Before World War II the attention of the management of the Lubumbashi plant had been directed to the problem of the loss of metals through the blast-furnace gases. Tests having shown that recovery of the metals from these fumes was interesting, a device was developed for treatment of the fumes. The escaping gases are first of all freed from the coarsest dust by cyclone separators of the Buell type. These yield a product containing most of the contained copper. The finer particles, containing principally zinc, lead, and cadmium, are retained in the bags of a filter installation. This necessitates a conditioning of the gases to be treated, before the fumes are admitted to this section.

Plants at Jadotville-Shituru

The concentrates of the oxide ores are treated for the recovery of copper and cobalt in the Jadotville-Shituru plants. The most important metallurgical researches of the Union Minière have concerned the treatment of these materials.

A few preliminary remarks are necessary about the sources of the cobalt which Union Minière has at its disposal:

Some of the deposits, such as, for instance, that of Musonoi, contain oxidized ores, the cobalt content of which can attain locally, or sometimes even surpass, 6 to 7%; also ores carrying 1.5 to 2% but susceptible of being enriched by concentration up to 7 or 8%. These rich products are smelted and reduced in electric arc furnaces at the Jadotville-Panda plants, which turn out a complex alloy called "white alloy" (*alliage blanc*). This is ultimately treated, either in Belgium or in the United States, to produce commercial cobalt.

The greater part of the company's reserves of cobalt consists, however, in oxidized copper ores, containing less than ½% of cobalt. On being concentrated for copper, a good part of cobalt passes into the concentrates. These are fed to the leaching plant at Jadotville-Shituru.

Data Shows Improvement in Social Picture Respecting Native Population in Katanga Area

Year	Women per 100 Workmen	Children per 100 Women	Average Number of Households	Births Annually Per 1000 Households	Births Annually per 1000 Population	Still Births per 1000 Births	Deaths per 1000 Children	Yearly Demographic Benefit per 1000 Population
1929	33	54	5,817	153	33	115	102	−51
1934	51	86	3,612	116	30	50	53	+
1939	59	94	6,928	162	45	44	38	+16
1943	64	123	12,208	194	51	46	31	+32
1947	74	145	11,581	212	54	29	42	+4063
1948	74	163	11,802	245	61	26	27	+51

The oxidized concentrates from Jadotville and from Kolwezi are supplied to this electrolytic plant at the rate of 28,000 to 30,000 tons per month. The ores from which they originate are strongly altered and the concentrates still contain a certain quantity of primary slimes of a more or less colloidal character. The characteristics which distinguish them from ores extracted from some large American mines have necessitated the use of equipment different from that used in the latter case.

To get the metal in the concentrates into solution, pneumatic agitating vats of the Pachuca type are used. These assure a longer contact and continued agitation of the particles in the acid solution. The nature of the products makes it necessary to subject the pulp which comes from the lixiviation plant to a decantation and a very careful clarification, so as to obtain a solution free from particles in suspension. This is indispensible to assure a satisfactory yield during the subsequent electrolytic operations. The section for decanting and clarifying the solutions, which is particularly well developed at Shituru, comprises at present an assembly of clarification equipment and washing decanters. The action of this equipment must be completed by passing the solutions through filter beds, which are formed by layers of gravel. This latter procedure was finally adopted, after fruitless tests with numerous other methods. After passing through a series of washing decanters, the thickened pulp is treated for recovery of the copper and the cobalt, as we will see in the following paragraphs.

A second problem was posed by the presence of iron in the solution sent to the electrolytic tank room. The iron which causes a reduction in the performance of the current and reduces the quality of the cathodes, has made it necessary to add a special section for its partial elimination. This is done by neutralizing part of the solution by copper ores of basic character, the presence of phosphoric acid making possible the precipitation of iron as ferric phosphate.

The rest of the electrolytic treatment of the copper hardly requires special comment. Let us mention, however, the particular type of electrolytic tank used, the unusual length of which—about 65½ ft.—presents no inconvenience. These tanks, which are less expensive, assure better removal of the copper from the solution and a better conductivity in general. The tank room is equipped at present with 160 tanks having 191 anodes and 188 cathodes each. It will be completed by a new section for the production of starting sheets with an output capacity of 12,000 tons of copper yearly. The capacity of the Shituru plants will then be 100,000 tons of copper.

Refining on the Spot

Cathodes made at Shituru are refined on the spot. They are recast to be molded into wire bars or into ingot bars, in three reverberatory refining furnaces fired with pulverized coal. The casting is done on Clark machines.

The concentrates that form the feed of the leaching plant contain cobalt also, as already mentioned. Contrary to copper oxides, the cobalt oxides are but little soluble in sulphuric solutions, if they are not in the presence of a reducer. The reducer chosen is the ferrous sulphate contained in the solutions. The conditions for electrolysis of copper maintain in the solutions which return to lixiviation a ferrous iron-ferric iron equilibrium which makes possible the solution of 200 to 300 tons of cobalt for a monthly production of 8,000 tons of copper. The solution of the cobalt is practically complete. Inasmuch as the cobalt is not deposited with the copper, the solutions en-

rich themselves until they reach a concentration of equilibrium, starting from which point the cobalt rendered soluble passes with the pulp rejected in washing the gangue. The solutions that impregnate these pulps contain about 6 to 7 gr. of cobalt per liter and 15 to 17 gr. of copper per liter. They are, first of all, neutralized by limewash, up to a controlled pH, provoking thus the precipitation of the iron and aluminum. These precipitates as well as the gangues are separated from solution by decantation and counter-current washing. The clear, decanted solution containing an average of 10 gr. of copper per liter is electrolyzed, so as to lower the copper content to 1 gr. per liter. This electrolysis necessitates, in order to obtain a desirable current and good cathodes, an energetic agitation of the bath. The solution impoverished in copper at the end of the electrolysis is neutralized again by lime in such a quantity that the remaining copper content is brought to about 0.3 gr. per liter. This operation is carried out in a series of Pachucas, the overflow of which is decanted in a Dorr apparatus separating solution from precipitate. The last traces of copper are taken away, by passing the solution over beds of metallic cobalt granules. The solution will then contain only cobalt, a little iron, nickel, zinc, manganese and magnesia.

Cobalt Precipitated

A new treatment by lime in the agitating machines yields a precipitate containing cobalt. This precipitate is supplied to the Electrolysis Section. Inasmuch as the cobalt is an electronegative product, the electrolytic deposition of it is possible only in a neutral solution. This is achieved by the electrolysis of a pulp containing cobalt hydrate in suspension. The hydrate acts as a neutralizing agent for the acid that has been liberated by the cathodic deposit. The harmful effect of the solids in suspension, about 100 gr./liter, the occlusion of which in the cathodic deposit would lower its grade, is neutralized by a mixture of the electrolyte obtained by the introduction of an air-flow through the anodes (especially designed to this end).

Another advantage of this air-flow is that it activates the reaction of the hydrates of cobalt with the acid. The electrolysis results in a consumption of energy of 4.5 kw.hr. per kilogram of cobalt.

The deposited cathodic cobalt is of the following composition:

Co	91-95%
Ni	0.45-0.7%
Fe	0.08-0.2%
Mn	0.1-0.3%
Zn	3 to 5%
S	0.1-0.3%
Cu	0.01-0.03%

It is refined in a 1,600-kva. triphasic arc furnace. This refining, similar to the operation applied in the production of extra-mild basic steels, permits a slightly oxidizing fusion which scorifies the manganese and a desulphuration by a reducing slag at a high lime content. The zinc, volatilized in large part at the beginning of the operation, is completely eliminated by a poling operation.

The liquid cobalt is then granulated in water and polished for export. The company's production of electrolytic cobalt amounts to 2,500 tons per year. The capacity of the plant will be increased shortly.

Other Industrial Accomplishments

Some of the metallurgical processes applied in Katanga, as already pointed out, have brought about the birth and development of a chemical industry in that province, Katanga. The principal activities of this industry have been the production of sulphuric acid and hydrolized oils, as well as of cadmium, chlorates and explosives. The operations of the mining industry provided the first outlet for plants producing electric energy and now permits the ever-growing development of installed power. At present there are two hydroelectric power stations in Upper-Katanga, 7 km. apart, on the Lufira River. These stations supply the high-tension network in parallel and are capable of an average yearly production of 500-million kwh. Another central station now under construction on the Lualaba river will increase this total to well-nigh 1 billion kwh per year, from 1953 on.

The electric energy available at the stations has contributed greatly to the development of a local industry, which is increasing year by year. A new plant for producing electrolytic zinc is scheduled to enter production in 1953. It will treat part of the blende from the Kipushi mine, and will constitute a new step in the development of the country's resources.

Social Accomplishments

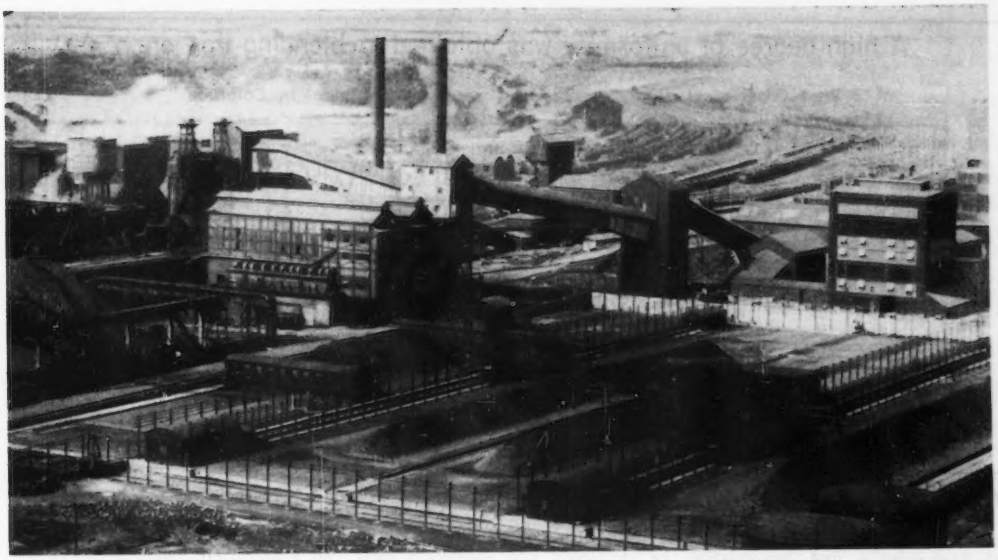
Due to the poverty of its soil, the Katanga was sparsely populated at the time its mines were opened for explotation. The Union Minière, for this reason, had to call in native labor and to create in its camps the conditions necessary for a successful growth and stabilization of its native staff. At present, the mining villages house more than 16,000 workers, 11,000 women and 23,000 children. The policy of stabilization followed for many years by the company, the assistance to the families, the constant development of medical services, the survey of alimentary hygiene have resulted in a very favorable demographic evolution of the native population of the camps (see accompanying table).

The professional education given to our natives gives them full opportunity to develop their particular abilities in an ever-increasing measure. This situation has resulted in most cases in the substitution of qualified native labor for white workers, and only the supervisory and clerical positions at present remain as the white man's sphere.

The number of native children of school age in our camps amounts to 10,000. A vast comprehensive program to organize instruction on a new basis is being carried out.

The increasing well-being of which the natives get the benefit by working in the industry of Haut Katanga, and the satisfaction which they derive from the life in the centers which the mining industry has brought to life, express themselves by the growing average seniority of the native workers and by the low number who refuse to renew their contract at the time of expiration.

Realizations in the social field impress even the visitors easily inclined to criticize the so-called "colonial" nations. They should know that, if Upper Katanga presents a state of evolution today superior to that which can be seen in other regions of Central Africa, it is due to the methods which have been applied for developing its wealth and natural resources. From the start, as this development grew, constant care was taken to let the native population share in the local prosperity, and to lead it gradually to civilization.



BED-BLENDING SYSTEM, in foreground, having four beds, serves for blending iron ores of various grades at the steel plant of Stewarts & Lloyds, Ltd. to secure uniform analysis of the blast-furnace charge.

Blending of Bulk Raw Materials . . .

- **increases production**
- **reduces operating cost**
- **improves quality**
- **extends reserves . . .**

when they are chemically or physically variable.

A. E. CONOVER
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AS THE INDUSTRIAL ECONOMY of the world continues to expand, the demand for its mineral resources steadily rises. To keep up with the need for greater production, there must be constant improvement in the efficiency of processing such basic resources as coal and the ores of the ferrous and nonferrous metals and nonmetallic minerals.

Dr. James Boyd, recently director of Defense Minerals Administration, said: "The scarcity of the products of our mines is perhaps the most limiting factor in our economy today. We must get the maximum production possible . . . from existing facilities . . ."

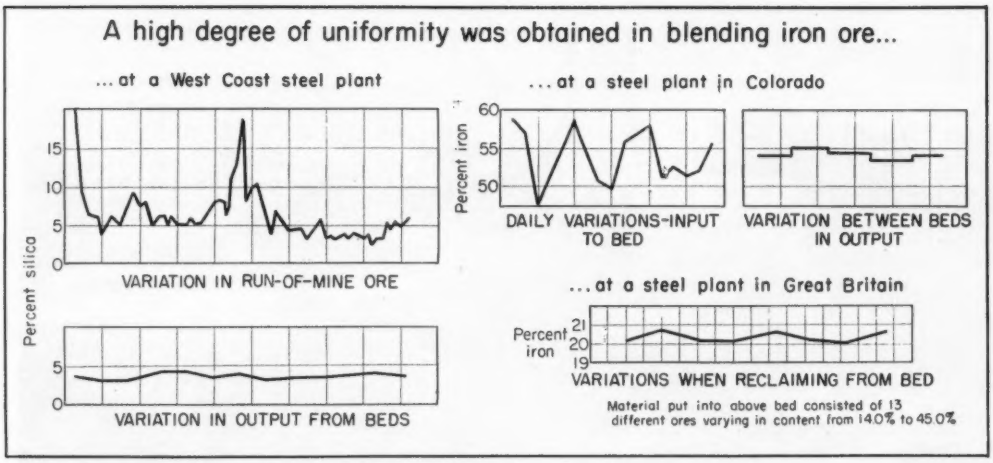
Unfortunately, nature seldom offers us her raw materials in a form from which we can convert them most economically. One of the conditions that increases both production costs and the extravagant use of reserves is non-uniformity. It follows that one way to approach "maximum production from existing facilities" is to reduce non-uniformity. This can be done through the use of an efficient system of blending bulk materials. Not only will blending extend the reserves of our basic raw minerals, but it will increase the output and improve the quality of the products made from them.

Definitions for Clarity

What is "blending?" The word is often mistakenly used in place of "proportioning" or "mixing." The following definitions should clarify for the readers of *E.&M.J.* the distinction between these three processes.

BLENDING of bulk materials is the process of combining any number of constituents which may be individually or relatively variable, physically or chemically. The resultant product, when drawn from the blending process, will be uniform and homogeneous and will have the same physical and chemical properties as the average of the entire input of raw material.

MIXING is the process of combining two or more constituents, each of which is assumed to be continuously uniform in the properties required in the end-product. Paddle mixers, pug mills, and mullers are examples of equipment used for this operation. Mixes can be made in batches, as in the case of concrete or molding sand, or continuously, as when combining streams



THE IRON ORE WAS SAMPLED as received and again after passing through a bed-blending system in each case.

of high-volatile and low-volatile coal for the production of coke.

PROPORTIONING is the operation of accurately combining components in specific quantities to produce a final product of predetermined analysis. It can be done continuously, by batches, by weight, or by volume. Mixing after proportioning will produce a homogeneous product only if the individual components are, in fact, continuously uniform in analysis. If one or more of them is variable, it only is possible to produce a homogeneous end-product by blending.

Uniformity Important

One of the important factors that determines the capacity of any bulk material processing plant is the physical and chemical uniformity of the raw material used. If such physical characteristics as size distribution, percentage of moisture, or specific gravity, for example, vary widely, the handling and processing equipment that is provided must be able to cope with the most unfavorable peak conditions. It follows that during normal periods this equipment is not operating at full capacity. If chemical analysis varies, the makeup of the charge for the process must be frequently changed. The number of these changes usually is kept as low as possible by an overcompensation which results in an increase of waste products or slag with lowered plant production. By blending the raw materials, however, the individual components of the charge will be physically and chemically uniform, so that all processing and handling equipment can run at peak capacity and chemical reactions can take place under the most favorable conditions.

When a uniform end-product is important, uniform ingredients are essential. A suitable blending system will insure that the raw materials used are of uniform analysis. The operating problems inherent in attempting to compensate for fluctuating characteristics in the feed will be eliminated. Furthermore, the risk of quality variation in the final product will be reduced to a minimum.

Fluctuation in analysis of any component used in a process often can be compensated for by suitable variation in other components to produce a commercially acceptable uniformity in the final product. Such practices are costly, however. Fluctuation in production, increases in manpower, and greater consumption of the compensating elements are some of the measurable cost-raising factors. An evaluation of their cost will determine the savings that can be made by the installation of a blending system. The type of blending system selected must be determined by equating the respective values of greater degrees of product uniformity against the cost of systems that will give such uniformity.

Reserves of high-grade raw materials can be extended for many years beyond their normally expected life by blending them with fractions of lower-grade materials. If the elements are thoroughly blended, a uniformly homogeneous product will result, having a predetermined physical and chemical analysis that will be of acceptable quality.

In considering the economics of such an operation it is necessary to balance the extra costs against the savings. The former will include such items as first cost and operating expense of the blending system and possible increase in plant-operating cost due to use of a lower-grade raw material. These would be offset by lower overall first cost of raw material due to its lower grade; reduction in operating cost due to consistent uniformity of raw material; postponement of exhaustion date of high-grade reserves which might then require operating on still lower-grade material; paying high cost for transportation of suitable grade material; or even the possibility of relocating the plant closer to the source of supply.

Another phase of this same problem is the up-grading of raw material reserves which may be deteriorating in analysis. This can be done by blending them with fractions of high-grade materials in proper proportions to produce a product that will be commercially acceptable.

Casual Methods May Give Poor Results

In many industries the raw materials used are so variable that blending is recognized as an essential procedure. More or less casual methods are carried out in an attempt to obtain a blended product.

Some of these methods include spreading successive layers of material by bucket, stacker, tripper, or bulldozer, and reclaiming more or less cross-sectionally by shovel, bucket, or tunnel gates. The results obtained, being dependent on the human element, the immediate space available, or the pressure of time, are inconsistent and unpredictable.

Bins of various designs and in various arrangement are frequently used to obtain a degree of blending, but to approach success the material must be free-flowing. The presence of moisture and fines can cause bridging and plugging at the draw-off gates, which restricts the flow through one or more of the compartments, defeating the objective. Inherent in a bin system is size segregation, during filling, which is not compensated for when emptying, due to the "shear cone" effect over the draw-off gate. Since analysis variations are frequently related to size of particles, segregation has just the opposite effect from that sought through the blending process.

Another important consideration in a bin-blending system is that the contents of any one compartment must be chemically and physically uniform within itself and must remain uniform. In this system, material from the various bin sections are collected in relatively few layers on one conveyor, and therefore if the material in any one or more bin compartments is variable, a consistent uniformly blended product will be impossible, as the material on one section of the gathering conveyor can not be blended with the material following behind it a hundred or so feet.

The Bed-Blending System

The most highly developed method of blending large volumes of bulk materials with the greatest degree of uniformity is the bed-blending system. It was first developed on a practical commercial basis in the early 1900's as the Robins-Messiter system. In those days copper was produced from high-grade direct-smelting ores which were brought to the smelter from many sources of widely varying analyses. These variations made it extremely difficult to maintain the proper proportion of fluxing elements to insure smooth smelter operation. Various forms of bins were designed in an attempt to solve the problem. The development of the bed-blending system eliminated the variations, making it possible to obtain a uniform charge over a long period of operation and to operate the smelter at high efficiency.

Actually a Sampling System

The bed-blending system is actually a large-scale sampling system and any unit of material drawn out is representative of the material which has been put in. Since any unit is representative, all units are, therefore, alike and a perfect blend of the input has been accomplished.

The sampling principle applied by this system is that of intermittently taking a uniform section from a moving stream with

(1) Constant intervals between cuts so that all sections along the length of the stream will be equally represented;

(2) Cuts taken at frequent enough intervals so that abrupt changes in character of the stream will be represented;

(3) Constant rate of flow so that each sample will be of equal size.

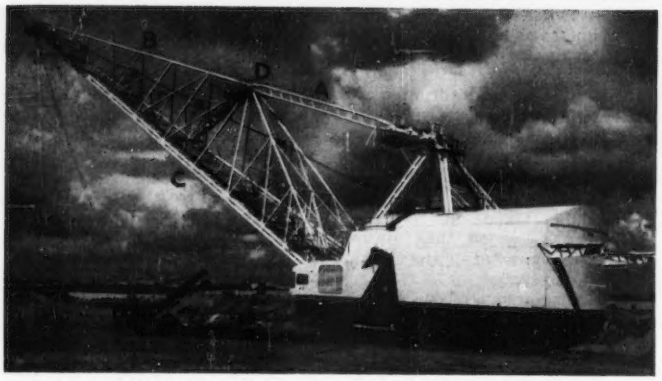
Application of this principle requires two steps. First, the material is spread at a constant uniform rate back and forth over a long area, gradually building up a pile, generally triangular in cross section, composed of hundreds of layers. Second, after the layered pile or bed has been completed, it is reclaimed by consecutively removing small cross-sectional increments. Any individual slice cut from the bed will contain elements from each of the horizontal layers. For example, if a bed contains 8,000 tons of ore and is made up of 400 layers, it will take 20 tons to make one layer. If the pile is 200 ft. long, it will contain 40 tons per lin. ft. or 6,667 lb. per lin. in. If material is brought from the bedding system at the rate of 250 tons per hour, reclaiming will be at the rate of 1¼ in. per minute. A conveyor traveling 250 fpm carries 400 lb. of ore on a 12-ft. length of belt. This is made up of 1-lb. increments from each layer or 1 lb. from every 20 tons originally laid down.

When a new bed is started, the first pass spread along its length will form a windrow roughly triangular in cross section (see photo on page 97). Continuing our example and assuming material weighing 100 lb. per cu. ft. with a 45 deg. angle of repose, the windrow will be about 34 in. across the base and 17 in. high. The second pass will add a layer about 5 in. thick on top of the windrow and each additional pass will add another layer. These layers will get thinner and thinner, due to the increasing surface area of the pile, until at the 400th pass the last layer will be about 0.3 in. thick. Even though the thickness of the layers grows progressively thinner, the cross-sectional area remains constant since the tonnage deposited per foot is uniform. Thus by laying down the same amount of material on the pile in each layer, the principle of sampling that requires increments of equal size has been satisfied. With the bed-blending system, a blend of predetermined accuracy and a high degree of uniformity is obtained unaffected by segregation and not limited to free-flowing material.

Three bed-blending systems are currently in the process of installation. One is in a South African steel plant which will be used to blend iron ore of variable analysis to produce a uniform charge for the blast furnaces. A second is in a South American smelter and will be used to blend copper concentrates of fluctuating assay together with fluxing elements, so that the charge to the reverberatory furnaces will be uniform in all components. The third is at a coke plant in England, to be used for blending high-grade coking coal in with cheaper but poorly coking local coals. The product of this blending will in effect be a new coal altogether, having qualities capable of producing good metallurgical coke of a uniform ash and sulphur content. Not only will blast furnace operations benefit by producing iron of higher quality at lower cost, but the life of the high-grade coal reserves will be greatly extended by using them only in sufficient quantities to up-grade the local coal to a point of economic usefulness.

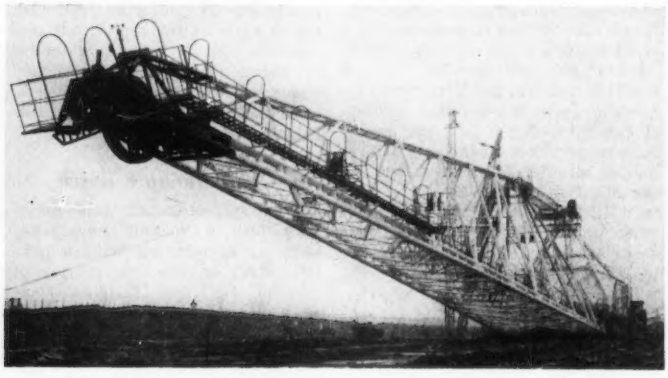
Conservation a Result

These three installations exemplify how a soundly engineered blending system can have a positive effect on the conservation of mineral resources through their more efficient utilization; first, because it makes possible an increase in plant production with no enlargement of physical facilities; second, because it increases the quality and uniformity of the final product; third, because it extends the useful life of depreciated deposits, thereby postponing the expected depletion date of high-grade reserves.



A 282-FT. BOOM fabricated by welding tubular sections made of special alloy steel is the outstanding feature of Stewarts and Lloyds' new dragline, now engaged in stripping iron ore. The bucket weighs 22 tons, holds approximately 27. Machine's total weight exceeds 1600 tons. A, suspension member; B, main tension member; C, main compression members; D, apex.

Boom 282 Ft. Long Features Biggest Dragline



AS THE BOOM WAS RAISED after construction was completed. When in operating position its head (left) is 175 ft. above the ground.

WHAT ITS OWNERS DECLARE to be the world's biggest walking dragline has recently been placed in service in the open-cut iron mine of Stewarts and Lloyds, of Northamptonshire, England, Britain's foremost makers of iron and steel. With a 282-ft. boom of tubular construction, a digging radius of 260 ft., a 22-ton bucket capable of taking 27 tons of ore at each bite, and a digging-dumping cycle of 60 sec., the new excavator can dig its own weight of 1600 tons every hour. The machine has been designed specifically for stripping the ironstone bed in the company's Priors Hall quarry, or pit, at Corby, to a depth of 100 ft. This quarry, opened 10 years ago, has an estimated reserve of 15 million tons of ironstone on a tract covering 850 acres. At a scheduled yearly production of 400,000 tons, its remaining life is put at 33 years.

The largest bodies of iron ore in Great Britain are in the form of stratified ironstone, a sedimentary deposit running in horizontal layers under varying depths of overburden. Stewarts and Lloyds' Corby Works are on the principal deposit. From its various quarries the company produces 4½ million tons of iron ore annually, most of which is used in its own furnaces, the Corby Works alone taking about 2 million tons per year. The ironstone may lie just below the surface or at greater depth, the maximum to date being 216 ft., found by drilling. The overburden usually consists of a few inches of top soil, then layers of clay, sand and often a limestone which must be blasted before it can be dug.

The Economic Problem

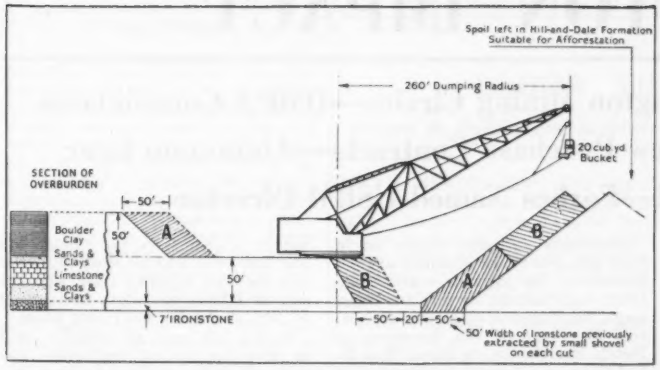
The ironstone bed itself is only about 7 ft. thick and poorer in grade than imported ore. It must be worked as cheaply as possible. Underground mining would be uneconomic. The cost problem becomes of major importance as overburden depth increases. In the present quarry at Corby it is as much as 100 ft. The distance at which the spoil can be dumped depends on the dumping radius and this, in turn, on the length of the excavator's boom. Although two machines working at different levels could be used, this would interfere with production and be uneconomic in addition.

The company also takes into account the desirability of restoring the land to agriculture after mining has been completed. The large excavators can dump the material only in parallel ridges and furrows, referred to as "hill and dale" formation. Such ground when planted with trees has yielded good woodlands at low cost.

Such are the circumstances leading to the construction of the big new dragline at Corby, with its dumping radius of 260 ft. and ability to dig 1600 tons per hour, for stripping up to 100 ft. of overburden in the quarry mentioned. Ransomes & Rapier, Ltd. were asked to design and build the machine to meet Stewarts and Lloyds' requirements. The order was placed in 1947 and the dragline was put in commission in 1951.

Construction Details

Tub Weights 227 Tons. The base structure, or tub, on which the superstructure weighing 1400 tons re-



IN OPERATION the big dragline is shown diagrammatically stripping 100 ft. of overburden in two lifts. "A" and "B" show successive cuts and disposal.

volves, is 48 ft. in diameter, 4 ft. high, weighs 227 tons. The rotate rack around the center post exceeds 33 ft. in diameter, has 208 teeth, each 19 in. deep. The superstructure or cab has 4387 sq. ft. of floor space, and its roof is 45 ft. above the ground.

Two Power Cables. Power for the machine is taken at 6600 v. through two trailing cables. There are two main synchronous a.c. motors, each of which drives three generators which supply the 225-hp. d.c. driving motors, 14 in. number and totaling 3150 hp.

Drag, Hoist and Swing. The two drag ropes, each 7 in. in circumference, pass through fairleads to the 5-ft. winding drum in the cab. The two hoist ropes are each 6½ in. in circumference, and run via the upper boom members to the hoist drum, 5 ft. in diameter. Maximum pull on both hoist and drag ropes is 100 tons.

The four motors for the hoist and the four for the drag motions are connected in pairs across each of the hoist and drag generators. These motors are shunt wound and separately excited from a 125-v. supply.

Each of the two motor-driven exciter sets supplies excitation at 125 v. for the d.c. motor and generators, and at 45 v. for the synchronous-motor field. Only one set is in use at a time, the other being a standby.

The swing motion is operated by the two rotate units, housed between decks. Each unit is self-contained and driven by one of the two swing motors.

The Bucket. This weighs 22 tons and is fitted with seven detachable teeth. Loaded, its gross weight is approximately 50 tons. The complete operating cycle takes about 60 seconds.

Moving the Boom. To hoist or lower the boom for maintenance a self-contained winch with a 4½-ft. diameter drum is provided. When the boom is in position, links are fitted between the suspension member and the "A" frame and the tension on the boom hoist rope is released.

Walking Shoes 56 Tons Each. When walking, the dragline covers about 600 ft. an hour in steps nearly 7 ft. long. Each shoe is 48 ft. long and 9½ ft. wide and weighs 56 tons. The machine's total weight of over 1,600 tons is distributed to the ground through the base plate of the tub. The distributed pressure is 14 psi. The complete cycle of each step takes about half a minute, during which the weight lifted on the shoes is about 1,150 tons, and the weight dragged at the front of the tub is about 550 tons.

The Walking Mechanism. To distribute the enormous load effectively through the longitudinal girders to the walking axles, a deep transverse bridge girder is built into the superstructure as an integral part of the machine. When walking, two-thirds of the weight of the base is carried by a hook system connected to the under side of this girder.

The axles for the walking eccentrics are built into each end of the girder and weigh nearly 8 tons each. The two walking shafts are 20 in. in diameter, weighing 16½ tons apiece. The outer ends of the shafts are squared and fit into recesses in the eccentric bosses, while the inner ends are also squared to take the main driving wheels. Each wheel weighs 10 tons, is 12 ft. in diameter and the teeth are 14 in. wide.

The heavy cast-steel boss at the outer end of each shaft transmits the eccentric motion to the shoes through the walking legs, which are attached to the shoes by universal ball connections.

This universal connection is essential, owing to the irregular nature of the ground over which the machine operates. It is also possible that one shoe may slip a greater distance than the other and be forced out of parallel. To correct this and to return the shoes to their correct position after each step a novel type of return mechanism is employed. This device utilizes torque tubes, linked through universal connections to the rear of each shoe, to return the shoes to their normal straight position each time they are lifted.

The Big Boom. Decision was made to construct a triangulated, tubular steel, cantilever boom of high-tensile steel. Use of tubular sections gives a boom much lighter than one built of rolled sections in the usual box-shaped design.

As the largest makers of steel tube in Great Britain, Stewarts and Lloyds had given thought to building booms from tubular sections, although up to the year 1947 the longest tubular boom in existence was only about 30 ft. long. In that year a 113-ft. boom of tubular construction was built. The conception of a 282-ft. tubular boom therefore meant a big step in advance. Stewarts and Lloyds made the necessary steel and from it the tubes required. A special high-tensile chromium-molybdenum fine-grain steel, aluminum-killed, was developed. Construction of the boom also called for development of a fabricating and welding technique. About 18,000 welding electrodes, weighing 2 tons, were used in assembling the boom.

Design for the big boom was evolved by Tubewrights Limited, Stewarts and Lloyds' subsidiary, in collaboration with Ransomes & Rapier, who had the overall responsibility for the entire machine.

The main compression and tension members were designed as twin tubes with distance pieces welded in. Two main compression members run from the heel pieces to the boom head and the main tension member from the head to the apex, where it bifurcates into a fish tail arrangement from apex to heel pieces. The main compression members taper from 16 in. in diameter under the apex to 10 in. at the head and 15 at the heels. The main tension boom tapers from 15 in. at the apex to 5½ at the head.

The twin-tube system was also used in planning the "A" frame.

The suspension member also controls the angle at which the boom works. With this type of dragline it is not usual to have a great change in the operating angle. A variation of 5 deg. is considered sufficient, except when the boom has to be lowered to the ground for a major overhaul. The more usual method of controlling this movement is by a series of wire ropes. Departing from this, a rigid box beam arrangement of four 10-in. tubes was adopted.

To provide the variation in the angle of operation, a link system was devised which can be easily altered. The links enable the suspension member to cushion any shock caused by sudden release of the load on the boom and to prevent compressive stresses in the upper tension member, as when the bucket gets snagged.

The task of constructing the boom required 18 months. Boom weight alone is 94 tons. With catwalk, suspension member and accessories, it is 126½ tons.

WASHINGTON IMPACT

New Vim in Washington Mining Circles—DMPA Consolidates Organization—New Purchase Contracts—Aluminum Czar Appointed—Forbes Named USBM Director

THERE'S A NEW DASH and sparkle in mining mobilization circles. After a summer of wilted hopes and drooping efforts to get mining going full blast as part of the mobilization effort, Jess Larson's Defense Minerals Procurement Agency is starting to move.

Immense difficulties were in Larson's path. Larson and the men around him don't like to dwell on the troubles they've had. In itself, that's a hopeful sign. DMPA has had plenty of administrative troubles getting started, but most of them seem to be solved, or on the way to solution. Now the team around Larson is bearing down on its real job, as is indicated by the way the log jam in copper has been broken.

Here is how DMPA is taking shape. Howard I. Young as deputy director of the agency, heads up operations under Larson. Young has as assistant Julian W. Feiss, who was assistant to the director of the Bureau of Mines.

New Organization

The job of putting policies into operation will be assigned to four divisions. Details may be changed, but as now planned these divisions will be: (1) domestic expansion; (2) foreign expansion; (3) program and development; (4) mining.

The most important policy changes from DMA days will center in the two expansion divisions — domestic and foreign. Plans are still taking shape, but one advantage will be readily apparent to the mining industry. Both expansion divisions have much more authority than the old production expansion division of DMA.

Additional authority shows up in their power to make advances against production, for example — something DMA could not do. In this and other ways, the domestic expansion division will fill some of the functions of Metals Reserve Co. in World War II, which became known as "banker of the mining industry."

James Douglas, who served for a time as deputy administrator of DMA, returned to Washington to direct the domestic expansion division. He will also function as assistant to Young. In addition to advances on production, the division will make long and short term purchase contracts and will direct the payment of subsidies if any are used.

Advances against production loom large in DMPA's plans. It hopes to get a big part of prospective expansion under way by this means. One advantage is that projects can be studied, approved and financed by this method entirely by DMPA. A loan, on the other hand, would have to be recommended by DMPA and then subjected to a separate study by RFC, which has the actual lending power.

A group of 15 persons headed by John Ford has been negotiating purchase contracts in GSA. One possibility is that this group will be moved into the domestic expansion division to do the same kind of work.

The foreign expansion division will be under Charles Stott, who will move over from ECA where he headed up the same type of program. He will bring a staff of 14 with him. Legal difficulties remain in cutting this program out of ECA; it apparently will require a change in the foreign aid law. But Stott and his staff will move into the GSA building along with the rest of DMPA and start functioning as part of the Larson-Young team.

Stott's big tool, as Douglas', will be advances against production. Actually, that is mainly how Stott has been operating at ECA. He will divide the world into six regions, with a director for each stationed abroad. Stott's program for ECA has been mainly in Europe, Asia and Africa. Thus, he's ready to go everywhere except in Latin America. A director and a staff for that area will be in operation soon.

The program and development division is actually the old supply division of Defense Minerals Administration. Tom Lyon who headed the division in DMA, and 50 of his staff simply moved from Interior to the GSA building. As in DMA, its job will be to study current and prospective supplies of metals and minerals, estimate civilian and military requirements, and submit programs designed to close the gap between supply and requirements.

All of Lyon's top men except one made the move with him: A. B. Parsons as assistant director and chief of program planning; Paul E. Pesonen, iron-nickel; James A. Barr, industrial minerals; Weston W. Bourret, minor and rare metals; Gunnard Johnson, lead-zinc; Justin B. Gowen, copper; George B. Holderer, ferro-alloys. The exception is Howard Heckman, head of the light metals branch in DMA, who moved to the new aluminum expansion office in Defense Production Administration.

EXPLORATION CONTRACTS CLEARED BY DMA

Company	Co. and State	Mineral	Gov't Share
Admiralty-Alaska Gold Min.	Alaska	Ni-Co	$108,000
Westmoreland Mang. Corp.	Independence, Ark.	Manganese	15,000
Calif. Quicksilver Mines	Lake, Calif.	Mercury	29,580
Tungstar Hanging Valley	Inyo, Calif.	Tungsten	52,500
C. C. Johnson and A. Dalla	San Juan, Colo.	Tungsten	3,750
H. E. Kolego	San Juan, Colo.	Pb-Zn-Cu.	7,300
Treasure Mountain G. M. Co.	San Juan, Colo.	Lead-Zinc	37,600
McRae Tungsten Corp.	Valley, Idaho	Tungsten	15,263
Silver Star-Queens Mines	Blaine, Idaho	Lead-Zinc	66,918.50
H. S. Steen	Lemhi, Idaho	Copper	15,000
Sun Valley Lead-Silver Mines, Inc.	Blaine, Idaho	Lead-Zinc	14,192
O. V. Svensson	Elenore, Idaho	Antimony	1,833.75
Compton I. White	Bonner, Idaho	Copper	28,655
A. A. Peugnet	St. Francois, Mo.	Lead	1,800
Commonwealth Lead Min. Co.	Madison, Mont.	Lead	25,290
Elkhorn Min. Co.	Beaverhead, Mont.	Thorium	9,194
J. E. Hall	Sanders Co., Mont.	Pb-Zn.-Cu.	10,642.50
W. Mulcahy	Jefferson, Mont.	Lead	$2,546.15
Taylor-Knapp Co.	Granite, Mont.	Manganese	37,202
Baker and Lovestedt	Douglas, Nev.	Tungsten	3,141
Cherry Creek Tung. Min. Co.	White Pine, Nev.	Tungsten	56,250
Marshall Min. Co.	Elko, Nev.	Copper	25,210.68
F. A. Judson	Macon, N. C.	Mica (Str.)	1,575
J. H. Ledbetter	Macon, N. C.	Mica (Str.)	2,430
Am. Zinc, Lead & Smelt. Co.	Murray, Okla.	Zinc-Lead	78,000
W. S. Clifford	Custer, S. D.	Mica-Beryl	12,149
E. H. Johnson	Pennington, S. D.	Be-Cb Mica-Ta	3,618
F. Michaud and L. Stratton	Custer, S. D.	Mica-Beryl-Cb-Ta	8,010
Combined Metals Reduct. Co.	Salt Lake, Utah	Lead-Zinc	27,550
G. O. P. Antimony, Inc.	Okanogan, Wash.	Antimony	17,400
Talisman Min. & Leasing Co.	Ferry, Wash.	Zinc-Copper	22,000
Dodgeville Min. Co.	Iowa, Wis.	Lead-Zinc	3,750
Vinegar Hill Zinc Co.	Lafayette, Wis.	Lead-Zinc	34,220

Mining Division

The mining division may be called something else on the final organization charts. It will do the job of the requirements division in DMA. Harold Montag will head the division, and will also continue as head of the mining machinery division of NPA. In his DMPA role, Montag will prepare statements of requirements of the mining industry for machinery, operating supplies, manpower, access roads, and similar production needs. He will then assume his other title, and as head of NPA's mining machinery division, present the industry's needs to the Industrial and Agricultural Equipment Bureau of NPA. He will have assistants heading up the work of each of his offices.

Deputy director of DMPA's mining division will be F. B. Speaker, who was chief of the MRO branch in DMA. The MRO branch was dropped in the shift to DMPA, and its functions absorbed by other branches. The set-up under Montag and Speaker will consist of four branches: metallics, under Emory Miller; nonmetallics, George Roll; manpower, Stephen Wood; housing and utilities (including access roads), Stanley Walker. These men performed the same functions in DMA. An additional branch is being considered — one to take over expansion and construction programs. It would handle 4-C applications for construction. If this branch is not established, 4-C applications will be handled by the metallics and nonmetallics branches.

Montag's deputy directory of NPA's mining machinery division will continue to be L. M. Case.

(Continued on page 104)

Brief But Important

COPPER RANGE CO.'S development at White Pine, Mich., finally has been given clearance by the mobilizers. RFC will make a loan of $57,185,000 for mine development, a mill, smelter, power plant, railroad and townsite. Output of copper is expected to reach 25,000 tons in about three years. No purchase contract with DMPA has yet been signed.

MANGANESE—A new use for low-grade domestic manganese ore has been reported by the Army Signal Corps. It is used in dry batteries in place of the high-grade product now utilized. The new battery costs more to make, but lasts twice as long.

NEW MINERAL DIVISION of the Bureau of Land Management, will be headed by Lewis E. Hoffman. He is a Government career man and a specialist in oil and gas leasing.

MANPOWER SHORTAGE — BLS forecasts need for 15,000 more metal miners and predicts increasing difficulty in recruitment. Fact is that many areas are in dire straits already.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

NEW STABILIZER: Eric Johnston's successor has his biggest job cut out for him. It is to make the best of the steel wage negotiations without a strike and without smashing wage and price controls. Wilson had that in mind in picking him.

PRODUCTIVITY: Out of the steel case will come a general policy for approving wage increases to compensate for higher productivity. Labor's objective is to make it apply to all workers, whether or not production is increased. It will amount to about 2%—over and above cost of living.

FORECAST: This is what we see in our crystal ball. The steel industry and union won't reach an agreement, and the issues will be put before the Wage Stabilization Board—without a strike. WSE will recommend a package settlement costing about 15¢ an hour. Steel prices will go up about $6 to $8 a ton, not enough to cover increased costs.

TOBIN NO HELP: Secretary of Labor Tobin thinks our economy is "menaced" by the failure of some unorganized workers to get sufficient wage increases. For this reason, he told CIO convention delegates unions should intensify their efforts to "organize the unorganized." As he has done before, Tobin laid particular stress on white-collar workers. They are better off in unions, he says.

INJUNCTION ENDED: The 80-day Taft-Hartley copper strike injunction, issued Sept. 5, came to an end last month. On Nov. 5, the board of inquiry reported to Truman that the only unsettled disputes were in zinc and lead in Idaho and Washington, and that only 10 to 15% of domestic lead and zinc production was involved. Anaconda was the last of the Big Four copper companies to sign up with Mine, Mill & Smelter Workers. "Package" settlements ranged from 19½¢ to 21¢ an hour.

MMSW IN CAPITAL: Washington contacts are important to Mine-Mill, despite opposition to Truman administration and controls. The union has reopened its office in the capital city. Herman Clott is in charge again after a Cleveland assignment. He sometimes can help speed up action on a wage-increase application at WSB if it involves Mine-Mill members.

NO NONFERROUS PANEL: There is no chance of another Nonferrous Metal Commission, such as functioned in Denver for the War Labor Board. The Wage Stabilization Board doesn't have funds to set one up. Major wage settlements have been completed. Mine-Mill is opposed to controls. Those are enough reasons.

CIO LEFT-WING REPORTS: The CIO trial committee reports which led to the expulsion of nine CIO unions for following the Communist Party line have been published by the Senate Labor Committee as Senate Document No. 89. Mine-Mill is included. You can write your senator or the committee for a copy. This document is a prelude to a committee investigation of possible legislation to cope with the Communist problem in unions. This investigation will differ from others on the Communist question in that it is sponsored by Senator Humphrey and others friendly to organized labor. They expect cooperation from "liberals" in and out of the labor movement.

FIRST INDICTMENT: The Justice Department has finally obtained an indictment against a union leader for making a false non-Communist affidavit under Taft-Hartley. But the victim is small fry: Anthony Valenti, business agent of the ex-CIO Food, Tobacco and Agricultural Workers' local at Campbell Soup Co. in Camden, N. J.

TRI-STATE DRIVE: Mine-Mill early next year will begin an organizing drive in the Tri-State area — Oklahoma, Missouri and Kanas — aimed at recouping losses to the CIO chemical workers.

LABOR IMPORT: Defense Minerals Administration is sounding out the unions on this idea: Set aside immigration quota for Europeans who agree to work at least a year in a metal mine; companies would have to make same commitments as for displaced persons. Since 1947 Canada has imported 5,000 mine workers with similar scheme. That's one reason some companies have no manpower trouble in Canadian mines.

OTHER LABOR SOURCES: You may be able to get Puerto Ricans for open-pit mines and smelter and mill jobs. Puerto Rican Government will underwrite 80% of transportation costs. These workers made good in foundries. Indians are being hired in Colorado. Idaho may try them, too.

KENNECOTT: NLRB denied a petition of the International Association of Machinists to represent sheet metal workes and overhead cranemen already under Mine-Mill contract at Hurley mill.

NEW BOOKS

Research for the Mineral Industry. Organized in 1949, with V. L. Mattson as director, the Colorado School of Mines Research Foundation is well equipped with facilities for research in geology, geophysics, metallurgy and mining, as well as for petroleum production and refining. The Foundation is a non-profit organization, set up to promote, aid, and encourage scientific and technological investigation and research in the mineral industry field. Its operating expenses are met almost entirely from income derived from sponsored research. A brochure recently received describes the facilities of the Foundation; also gives a partial list of the projects sponsored during 1950-51.

Mesabi Pioneer. No better representative of the men who helped disclose and open up the resources of the Mesabi Range could be found than Edmund J. Longyear, whose story of his early search for iron ore in the northern wilderness is told in a 116-page book recently published by the Minnesota Historical Society at St. Paul. It was in 1890, at the beginning of Mesabi history, that Mr. Longyear put down the first diamond-drill hole on the range. In the next 20 years, throughout its length and breadth, he sank over 7,000 such holes and test pits. As told in a foreword by Harold Dean Cater, the Society's director, he lived "in tent camps with his crew or in crude dwellings with his family near his drill and tripod, traveling over rough trails and actually building roads over which he could transport his equipment and supplies," and "He knew pioneering on the Mesabi in the true sense of the word."

Publication of the book has been made possible by a gift to the Society from the E. J. Longyear Co. of Minneapolis, the company founded by Mr. Longyear.

"Steel Serves the Nation." Under this title appears the handsome book which the United Steel Corp. has prepared in celebration of its Golden Anniversary. The 227-page book, roughly 9x12 in. in size and bound in gold-lettered blue cloth, is strikingly illustrated in color and in black and white. Text and pictures have been prepared to portray the great achievements of the corporation in its first half-century, paralleling the country's economic growth. The book is a factual summary of the company's performances and services.

Following a preface by Mr. Olds, board chairman of the corporation, the contents comprise two parts. The first covers five chapters which deal with the corporation itself, its origin and growth, its part in two world wars, its dependence on research, and its relations with its employees and the public.

Part II deals with the company's operations, the mining and preparation of its raw materials, the making of iron and steel and steel products for a myriad uses, its services, and the distribution of its output to its world-wide market. An index increases the book's usefulness.

Inquiries for information regarding this book, which has been issued under the by-line of Douglas A. Fisher, should be addressed to J. Carlisle MacDonald, assistant to the chairman of the corporation at 71 Broadway, New York, N. Y.

Washington Impact

(*Continued from page 103*)

New Purchase Contracts

With Howard Young as "spark plug," DMPA has been turning out a steady series of contracts. One of the biggest was with Anaconda and underwrites the development of the company's Yerington mine in Lyon County, Nev. Anaconda will invest $32,750,000 in the property. Its estimated life, at a production rate of more than 30,000 tons a year, is 10½ years. During the first six years of operation, the Government will buy whatever amount Anaconda cannot sell to industry, up to a maximum of 192,000 tons. The price agreement is for 25½¢.

Another sizable purchase contract was made with Phelps-Dodge, which will spend $25-million expanding the Bisbee East orebody. DMPA has agreed to buy up to 112,500 tons of copper from the project at 22¢ per lb. Output is expected to reach 38,000 tons a year. The new facilities will get into production in late 1954 or early 1955.

DMPA agreed to purchase up to 170-million lb. of copper at 23¢ from the Copper Cities' orebody near Miami, Ariz. The company will spend $15,200,000 on an expansion program, which is expected to result in output of 22,500 tons of copper annually beginning in October, 1954.

Three zinc agreements have been made. DMPA has agreed to buy at 17½¢ per lb. up to 300 tons of slab zinc a month to be produced by new facilities of the American Zinc Co. of Tennessee at its Jefferson County orebody. DMPA signed a letter of intent with the Volcan Mines Co. of Lima, Peru, to buy up to 380 tons of slab zinc a month for three years, at 17½¢ per lb. The largest zinc agreement so far is with National Zinc Co. DMPA has agreed to buy up to 600 tons a month at 16½¢. The ore will come from Monterrey, Mexico, where it will be beneficiated and shipped to the company's smelter at Bartlesville, Okla. In each case, the company will make substantial investments: $340,000 by American Zinc, $750,000 by Volcan Mines, and $450,000 by National Zinc.

Aluminum Czar

The appointment of Samuel W. Anderson to head all phases of the aluminum expansion program was a step away from centralization of minerals authority in DMPA. Anderson is a deputy DPA administrator, reporting to Manly Fleischmann. He will run his own operation for aluminum and the raw materials it requires.

This is not centralization of authority, such as President Truman talked about when he announced DMPA. But it is in the Washington tradition so far as aluminum is concerned. This metal has been handled as something apart since the first days of mobilization. Even when it was assigned to the old light metals branch of DMA, the real planning and negotiating was always carried on by the top mobilization brass. It has been a metal which appeals to cabinet officers, agency directors and influential senators as worthy of their personal attention, so it is no surprise to find it taken out of DMPA and assigned to a special niche.

Anderson was a program vice chairman for WPB in World War II, with a background in finance. He served for two years as director of ECA's Industry Division. When he got the aluminum assignment, he was with the International Bank for Reconstruction and Development.

New Bureau Director

Although it had been rumored that the Interior high command planned to leave the Bureau of Mines directorship vacant for some time, principally out of distaste for a controversy with John Lewis, in a surprise move John J. Forbes was appointed director on Nov. 10.

Forbes has been with the Bureau for 36 years. He has worked as an anthracite miner, and much of his early experience in the Bureau of Mines was in coal. In recent years he has been chief of the Bureau's Safety and Health Div., which has taken him actively into all kinds of mining. He has played a leading part in safety work for years.

When Forbes' appointment was announced, a spokesman for the United Mine Workers warmly praised the selection as "an excellent one." This recalled the bitter fight Lewis put up against Forbes' predecessor, James Boyd, whose salary was withheld for a year when Senator Johnson of Colorado blocked his appointment. There will be no such opposition to Forbes. His appointment was also welcomed by Administration strategists with an eye on coal miner votes.

MARKETS—Trends and Prices (*Continued from page 69*)

United States and Foreign Copper Statistics

(Copper Institute)

The latest domestic and foreign statistics on copper, excluding Russia and several countries of lesser importance, figures in short tons, are summarized in the following table:

United States

Production:	Sept. 1951	Oct. 1951	Jan.-Oct. 1950	Jan.-Oct. 1951
Crude primary	71,964	85,754	772,088	801,290
Crude, secondary	2,201	2,070	104,234	50,840
Totals	74,165	87,824	876,322	852,130
Refined	74,354	104,148	1,059,894	997,638
Deliveries, refined	(a) 121,879	(a) 125,286	1,137,525	1,124,564
Stock at end, refined	(b) 62,093	(b) 78,192	56,945	78,192

Outside United States

Production:	Sept. 1951	Oct. 1951	Jan.-Oct. 1950	Jan.-Oct. 1951
Crude, primary	112,851	122,840	1,119,118	1,146,231
Crude, secondary	656	490	10,546	4,467
Totals	113,507	123,330	1,129,664	1,150,698
Refined	101,133	115,825	928,172	1,012,696
Deliveries, refined	74,131	89,495	739,606	811,873
Stock at end, refined	163,538	170,477	135,712	170,477

(a) Includes tonnages of copper delivered to U. S. consumers from Government stocks.
(b) Includes deliveries to consumers at foreign ports.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as November ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	227	0	0
Fire refined, high conductivity	227	0	0
Fire refined, high grade	226	10	0
Fire refined, min. 99.7 percent	226	0	0
Fire refined, min. 99.2 percent	225	10	0
LEAD:			
Soft, foreign duty paid	175	0	0
Soft, Empire	175	0	0
English, refined	176	10	0
ZINC:			
Foreign (G.o.b.) duty paid	190	0	0
Domestic (G.o.b.) duty paid	190	0	0
Prime Western and debased	190	0	0
Refined and electrolytic	194	0	0
Minimum 99.99 percent	196	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

November 30, 1951

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	53.35c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.55
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.40
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$215 @ $218
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$33.00 @ $36.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3, 3 to 1 ratio	$43.00 @ $54.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$246.50
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.23 @ $1.28, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 85c, to 95c., c.i.f., duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.50
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U. S. equivalent, duty extra	(a) $65.00
Domestic, scheelite, 60 percent f.o.b. mine	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$135.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 71%, ceramic grade, per lb.	$1.76 @ $1.78½
Copper Sulphate, 100 lb	$8.95 @ $9.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¼c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$5.00
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

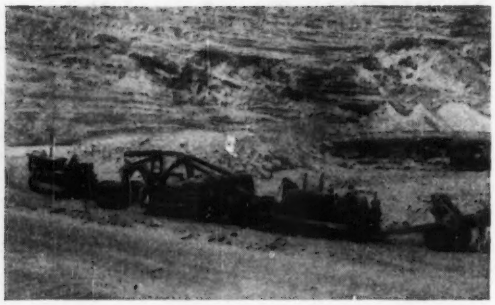
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$43.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c, per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$35.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

H. W. BISHOP, chief engineer, Consolidated Coppermines Corp.; C. D. Riley assistant supt., Isbell Construction Co.



THIS STRING of massive diggers (see text) did drilling, blasting, loading, haulage work in one step.

Morris Pit Produces 5,100 Tons Daily; Upper Stripping Done by Novel Means

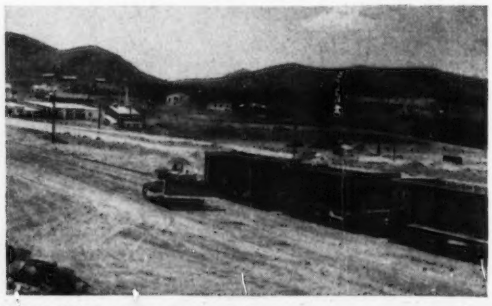
EASTERLY PORTION, Morris pit. Note the difference between standard benches below, and the upper one-third of bank stripped by Carryall-Rooter system. This new pit became a substantial producer of copper in 1951.

CONSOLIDATED COPPERMINES CORP.'S new Morris pit, in the Ruth-Kimberly area of White Pine County, Nevada, is now producing about 5,100 tons of copper ore daily, and about 15,000 tons of stripping daily. All work at the Morris is done by Isbell Construction Co. under the direction and supervision of Consolidated's engineering staff: A. J. O'Connor, general manager; H. W. Bishop, chief engineer.

Nearly 3-million tons of waste in the uppermost parts of the pit were stripped by a novel technique which required no drilling or blasting. In normal work, a Caterpillar D8 tractor pulled a LeTourneau 18-cu-yd. Carryall which has a heavy rear bumper; in loading and on grades, a second tractor pushed the Carryall and pulled a LeTourneau Rooter.

Established benches are worked by typical truck-pit methods and equipment: drilling 9-in. holes with B-E 42T's and 29T's; blasting with 60% bag powder; loading with Northwest 2½-yd. and P&H 3½-yd. shovels; mine haulage with Euclid 10 and 15-yd. trucks which dump directly into railroad cars holding 70 to 85 tons; and rail haulage for 22 mi. to the McGill smelter. As of the middle of June, the Morris pit had produced 8,500,000 tons of waste, and more than 500,000 tons of ore averaging 0.83% copper.

EUCLID 15-YD. TRUCKS dump ore directly into railroad cars for haulage to smelter. Note truck-dump siding.



CATERPILLAR D8 TRACTOR, which spots cars at truck-dump siding, is attached to end car by two steel cables.

THIS MONTH IN MINING

Anaconda Plans to Enter Aluminum Industry and Will Also Develop Yerington Copper

Anaconda Copper Mining Co. plans to enter the field of primary aluminum production. In that field, it will be the No. 4 entry alongside the three large established producers: ALCOA, Reynolds and Kaiser. The new plant will be built at Kalispell, Mont., where Anaconda has taken over from Harvey Machine Co. And at Yerington, Nev., Anaconda will build a new plant to produce 60 million annual lb. of copper. Total cost of the two projects will be upward of $64 million.

At Kalispell, Mont., Anaconda will build a primary aluminum plant consisting of 3 potlines which will produce at least 108 million annual lb. of aluminum metal. ACM recently acquired Harvey Machine Co.'s contract for power from Hungry Horse dam, and is forming a new Montana company (in which Harvey will have a small interest) to operate the Kalispell plant. The new company will buy its alumina from other companies in this country (Harvey had planned to ship bauxite from foreign sources and make alumina in its own plant in Washington). Management estimates that the plant will cost at least $40 million, all of which will be financed by Anaconda. Regarding the timetable for the project, Cornelius F. Kelley, chairman of Anaconda's board, says "the entire project depends upon the necessary clearances from Washington in the matter of critical materials and so on. When the required authorizations are granted, we hope to begin construction immediately."

At Yerington, Nev., the company will develop an open-pit mine and leaching plant for producing 60 million annual lb. of copper. DPA has issued a certificate of necessity which permits quick write-off of 75% of the estimated $24,560,000 cost of the project. Preliminary plans call for mining 11,000 daily tons of oxide ore which runs approximately 1% copper. The ore will be treated by conventional leaching methods: solution by sulphuric acid and precipitation of cement copper by metallic iron. Because the ore does not contain enough sulphide to generate all of the necessary acid, Anaconda has acquired the Leviathon sulphur mine approximately 60 mi. from Yerington in Alpine County, Calif. The sulphur will be mined, hauled to Yerington, and processed into acid.

Copper Canyon's Julie Produces Again

Copper Canyon Mining Co.'s copper-lead-zinc-gold property, 18 mi. southwest of Battle Mt., Nev., resumed operation after a year of idleness following the fire in the Julie shaft in June, 1950. Mining had been in progress for some time, but broken ore was stored underground pending completion of headframe repairs and installation of self-dumping skips. The job was completed late in May, and ore is hoisted currently from the 200 and 500 levels. Dewatering of the bottom, or 700 level, is carried on around-the-clock, seven days a week.

Repairs to the crusher building—part of which was burned in the shaft fire—have been completed so that the plant is fully restored. New and larger pipe lines and power and communication cables have been installed in the shaft, following reconditioning of the upper fire-damaged 249 ft.

The company announced that it will revamp the flotation section of the 350-ton flotation mill by installing a differential lead-zinc flotation circuit in lieu of the bulk flotation circuit now in use. A zinc smelting contract has been negotiated so that lead and zinc output will be smelted separately. Along with the flotation changes, plans are maturing to add sampling facilities for receipt of custom ore. Company officials indicated that custom ores would be treated to the limit of mill capacity. The mill currently handles 120 tons of ore a day on a one-shift basis, but an increase in tonnage is expected as soon as the 700 level has been unwatered and rehabilitated.

Copper Canyon is Nevada's No. 2 producer of lead and No. 3 of zinc. Although main effort is now on lead and zinc production, the mine still ranks as the state's No. 3 copper producer, just behind the pit mines of White Pine County. R. H. Raring is general manager.

CMR May Build Plant For Pioche Ore in 1952

Oxide ore from the Pioche district of Nevada may be utilized in the near future. Combined Metals Reduction Co., with large untapped reserves of bedded oxidized zinc-lead ore, (also containing some manganese) has sought an economic means of processing that ore since before World War I. Through recent intense research, company metallurgists have apparently come close to their goal of finding a commercial process for the ore. In an interview in Salt Lake City, Otto Herres, CMR's vice president, shed new light on the company's progress. He pointed out that "a big change" in CMR planning has come about through completion of the custom lead-zinc mill at Pioche (the Caselton mill which has a current capacity of 1200 daily tons).

"Now the stage has been reached where the results of years of research are taking commercial form. Giving

HARRY GRESHUK, Utah Construction's project manager, watches water flow that will revive the Robert Emmet.

Leadville Tunnel Taps Robert Emmet Shaft

Crews driving the Leadville tunnel reached one of their major objectives when they tapped the Robert Emmet shaft in October. Four drill holes, two 24-ft. holes from the tunnel itself, and two 16-ft. holes from a short lateral, pierced and brought a strong flow of water from that Empire Zinc Co. shaft. When the water in the shaft drains, the short lateral will be driven to the shaft.

Lake County mines have produced lead, zinc, and other metals valued at more than $465-million. Nearly all of it came from Leadville, once Colorado's second city. Costly pumping was halted during eras of low metal prices, and melting snow waters silently captured the district.

The U. S. Bureau of Mines' Leadville tunnel, now at 9,995 ft. from the portal, is making about 4,680,000 gallons of water per 24 hours. Estimates of the total drainable stored water run from many millions to perhaps billions of gallons. As miles of old workings slowly drain, Leadville's still substantial ore reserves are being exposed.

Utah Construction Co.'s next objective: Crews will drive a lateral about 2000 ft. eastward toward an area of virgin and partially exploited ground.

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commercial value to oxidized lead-zinc ores will add much new income to many mining districts when the process for treating such ores reaches a large tonnage basis."

"But while the possibilities are great, it must be kept in mind that new plants cannot be built overnight, and new processes cannot be placed in immediate production. It will be some time in 1952 before plans are completed and plants are under construction."

New Metallurgy May Solve Riddle of Oregon Nickel

The M. A. Hanna Co. and the U. S. Bureau of Mines are working simultaneously on metallurgical research which may result in a commercial process for utilizing the nickel deposit near Riddle in southwestern Oregon. Hanna leased the Nickel Mountain deposit (aptly known as the Riddle deposit), explored it by drilling and trenching, and proved it to be the largest deposit in the U. S. Several million tons average 1 to 2% nickel, 10% iron, and a trace of chromium; note that the nickel content is higher than the Sudbury average.

The problem is that the nickel is contained in garnierite, a hydrous nickel-magnesium silicate. The nickel, wrapped-up in the mineral molecule, has resisted all attempts at concentration. On the last previous attempt, in World War II, Freeport Sulphur Co. dropped the deposit when it failed to find an economic way to process the ore.

At its Northwest Electrodevelopment Laboratory in Albany, Ore., the Bureau is conducting research to develop a low-cost method of smelting the garnierite to produce nickel-iron alloy for the iron and steel industry. P. D. Dettmer, metallurgist, and R. T. C. Rasmussen, chief of the Ferrous Metals Branch of Region II, have brought the process to pilot plant stage; they are using a 3-phase, 24-in.-diameter, 100- to 300-watt electric furnace designed by the Bureau. Indications are that they can produce a crude iron alloy containing about 15% nickel, some chromium, silicon and carbon.

M. A. Hanna has been cooperating with the Bureau, and is also conducting its own research on the Nickel Mountain ore. In Minnesota, Hanna is now building a small pilot plant at its Hibbing research laboratory. Hanna engineers believe they may have worked out a process for extracting nickel at costs in keeping with today's price of nickel.

Labor Needs of Mining Are Increasing

The metal-mining industry will need 15,000 additional men by 1955, according to the Bureau of Labor Statistics. The industry now employs 105,000, but will need 120,000 four years from now. Today's employment by metals is 37,000 in iron mining, 28,000 in copper mining, 21,000 in lead-zinc mining.

Two needs are suggested by the Bureau's announcement:

1) **Conservation of manpower by efficient use of men, and by mechanization.**

2) **Recruitment and training of more miners.**

In the past 40 years, even though U. S. metal mines are working lower-grade deposits, the metal-producing efficiency of labor has more than doubled.

National Lead Will Make Cobalt, Nickel, Copper

At Fredricktown, Mo., as the result of a DMPA-company agreement, **National Lead Co. will exploit one of the three major cobalt reserves of the U. S.** (other two: Calera at Cobalt, Idaho, and Bethlehem at Cornwall, Pa.), and will also produce important amounts of nickel and copper. Source of the metals will be rejected residual iron concentrates at the company's reduction plant.

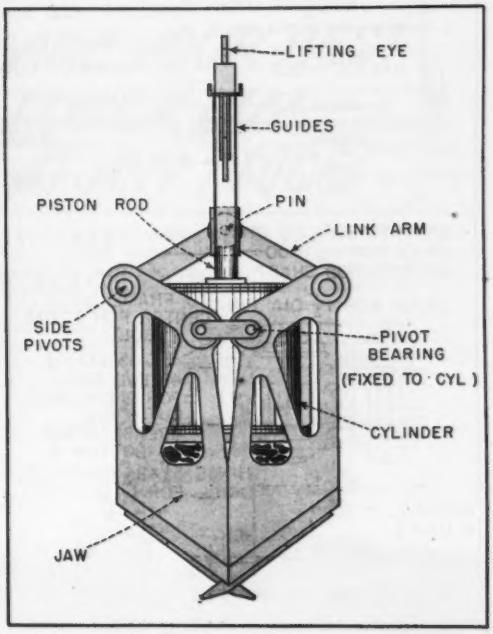
The agreement: The Government will advance money for new equipment. The company will repay the advance in 20 equal installments with interest at 4% per annum. In return, the company will spend an estimated $5 million including the cost of a new metals-separation plant, which is scheduled for operation within 18 months. DMPA officials say that in 5 years the plant will produce 6,930,000 lb. of cobalt 9,261,000 lb. of nickel, and 7,087,500 lb. of copper. DMPA has agreed to buy the plant's production (either as metals or concentrates) at $1.845 per lb. of cobalt, $0.474 per lb. of nickel, and $0.214 per lb. of copper f.o.b. cars at Fredericktown.

The new leaching process to be used is one developed and licensed by Chemical Construction Corp. The process has caused considerable excitement in metallurgical circles because it involves solution of the contained

(*Continued on page 127*)

OPERATING IDEAS

HALF A CREW sinks a shaft . . . .



IN LESS TIME with this new grab.

Shaft Mucker Uses Air-Powered Jaws

Data from OPTIMA, a quarterly review published by Anglo American Corporation of South Africa.

Perhaps the major drawback of shaft-mucking grabs has been lack of a power system for closing the jaws. From South Africa comes a new design which opens and closes the jaws by air power, exerts full downward pressure on broken rock as the jaws close, and yet has the low center of gravity necessary for stability.

The grab pictured above was developed by C. McLauchlan, E. A. Johns, and H. Carlstein, all of Anglo American Corp. The unit was first used in sinking Free State Geduld No. 1 shaft in 1950, and is being used in successive Free State shafts. In previous shafts, boys hand-lashed (shoveled) broken rock into kibbles (sinking buckets).

The major units of the grab system are similar to those used in the Riddell system:

1) An **operating platform** is suspended below the bottom set. At Geduld No. 1, it consisted of a 10x46-ft. framework upon which traversing carriages move to position the grab in the shaft bottom.

2) The operator rides on a **traversing carriage** which propels itself along the operating platform and which mounts the hoist from which the grab is suspended.

3) **The grab itself.** At Geduld No. 1, two grab-and-carriage units were mounted on the same operating platform. (When mucking was completed, the grabs and traversing carriages were hoisted to the surface).

The grab (see sketch) is suspended from a **lifting eye** which is immovably connected by **guides** to the head of a two-way air **cylinder.**

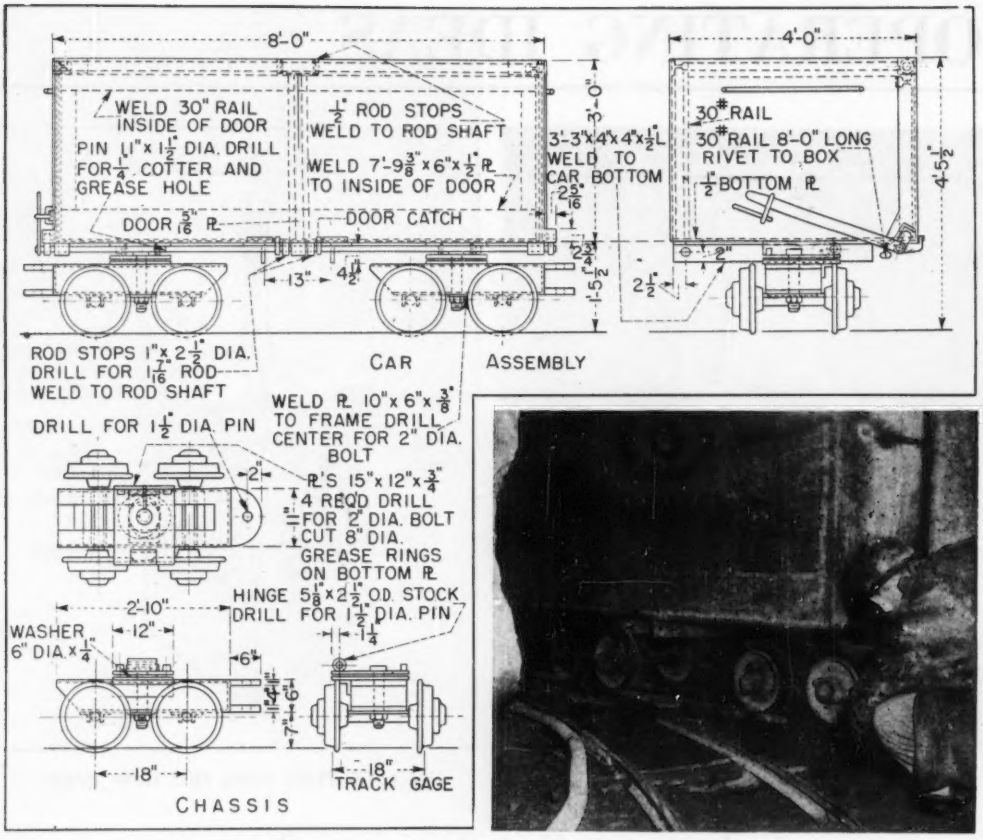
The two grab **jaws** rotate on **pivot bearings** fixed to the cylinder wall. A **pin** inserted in the upper end of the piston rod is housed on each end by G. M. shoes which ride up and down on the guides. The pin, in turn, transmits force to **link arms** which actuate the jaws.

Important design features:

1) Because the link arms are most horizontal as the jaws close, **maximum closing force** is transmitted to the jaws at the instant of closing.

2) Use of the two fixed pivots on each side (instead of a common pivot) allows for **wide opening of the jaws** and for full loading with only a shallow bite.

In Geduld No. 1, two grabs operated simultaneously, dumping into 4 kibbles (two 2½-ton for one hoist and two 4-ton for the other). At designed speed, an operator dumps a grab-load every 30 seconds. Two grabs excavated a 5-ft. round (275 tons) in just under four hours.


8'-0"
WELD 30" RAIL INSIDE OF DOOR
PIN 1" x 1½" DIA. DRILL FOR ¼" COTTER AND GREASE HOLE
½" ROD STOPS WELD TO ROD SHAFT
WELD 7'-9⅜" x 6" x ½" PL TO INSIDE OF DOOR
DOOR ⅝" PL
DOOR CATCH
13"
4½"
3'-3" x 4" x 4" x ½" L WELD TO CAR BOTTOM
2⅝"
1½"
5"
4'-0"
30# RAIL
30# RAIL 8'-0" LONG RIVET TO BOX
½" BOTTOM PL
4'-5½"
2½"
ROD STOPS 1" x 2½" DIA. DRILL FOR 1 7/16" ROD WELD TO ROD SHAFT
CAR ASSEMBLY
DRILL FOR 1½" DIA. PIN
WELD PL 10" x 6" x ⅜" TO FRAME DRILL CENTER FOR 2" DIA. BOLT
PL'S 15" x 12" x ¾"
4 REQD DRILL FOR 2" DIA. BOLT CUT 8" DIA. GREASE RINGS ON BOTTOM PL
2"
2'-10"
HINGE DRILL 5⅛" x 2½" OD. STOCK FOR 1½" DIA. PIN
WASHER 6" DIA. x 1¼"
12"
6"
1¼
18"
18"
TRACK GAGE
CHASSIS

Twin Trucks Help Large Car Make Short Turns

Teck-Hughes Gold Mines, Ltd., Kirkland Lake, Ont., found that their standard 1-ton car was too small to operate efficiently with loaders on lower levels. To meet the situation, they designed a 5-ton (96-cu. ft.) car which uses two sets of the old 1-ton trucks so that the large capacity body can negotiate sharp turns in the haulageways designed for the 1-ton cars. The homemade car is a side-dump unit and requires a restraining chain which prevents car overturn during dumping.

Portable Booster Compressors Keep Mine Air Pressure Up

J. G. Hall, general superintendent, Chief Consolidated Mining Co., Eureka, Utah, describes the following installation of booster compressors to maintain high air pressure at the company's mining operations:

We are using high-speed portable compressors underground. Specifically, a Gardner-Denver Model WBH 4011, 870 rpm with 75-hp. motor which produces 350 cfm at 110 lb. pressure. Units are air-water cooled with self-contained radiator. The receiver is 7x4 ft. Booster compressors are located as near to the heart of the operating area of the mine as possible. The major operating areas are roughly 5,800 ft. from the main surface compressors, two of which have a total capacity of 4,200 cfm. The compressed air reaches the major operating areas through an 8-in. pipe line or the equivalent, with a resultant pressure drop of about 5 psi or less. The boosters are automatically controlled to start if the main line pressure falls below 95 psi, and stop when the pressure reaches 110 psi. Actually it is a much simpler matter to have small units which operate as needed, as compared with starting up a larger unit. Also the effect of the addition of air to the system, with practically no line losses, seems to aid in maintaining an average air pressure of 100 psi at all working faces—a very important item in rock drill, slushing, and mucking machine efficiency. Failure to maintain high air pressure means lower output per man.

Exide-Ironclad
BATTERIES
ARE YOUR BEST POWER BUY— AT ANY PRICE

They PROVIDE ample power for fast, high-production haulage—more trips per shift, dependable round-the-clock performance, with no end-of-shift slowdown, no unscheduled down time . . . ASSURE inherent safety, with freedom from hazards of fire, fumes, noise . . . SHOW low costs of operation, maintenance, repair, depreciation. SIZES for all makes of battery-powered mine locomotives, trammers, shuttle cars. Call in an Exide Representative and let him prove these facts.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off.*

PERSONAL NEWS

ALFRED H. DREWES (left) has been elected a vice president of National Lead Co. He is a member of the board of directors and the executive committee. JOSEPH J. MORSMAN, Jr., (center) was named treasurer, succeeding CHARLES SIMON, (right) who has retired after 47 years of company service.

Joseph H. Mader, former editorial director of the American Petroleum Institute, has been appointed director of public relations for Reserve Mining Co.

W. H. Loerpabel, formerly general manager of American Smelting & Mining Co.'s mining department, was elected a director and executive vice president of Northern Peru Mining and Smelting Co.; and vice president of Compañia American Smelting Boliviana, S. A. Mr. Loerpabel now directs the company's business in Peru and Bolivia from headquarters in New York.

C. P. Pollock, formerly resident engineer of the company's mining department, was appointed assistant to R. F. Goodwin, vice president.

V. I. Mann is now a director and a vice president of the Neptune Gold Mining Co.

Robert Henderson is now with the mining division of E. J. Longyear Co., Minneapolis, Minn. He brings experience gained in Ontario, Oregon, Montana, and Colorado. At Climax, Colo., he was assistant and superintendent of mines. Most recently, Mr. Henderson has acted as consultant on mining problems.

Charles A. Cleeves has joined the mining division of E. J. Longyear Co., Minneapolis, Minn. His experience was gained in Nevada, California, and Colorado, in the fields of operating, engineering, mining and diamond drilling.

Pascual Gutierrez Roldan is now director general of Altos Hornos de Mexico, S. A., Monclova, Coahuila. He succeeds **Enrique Sarro**, who recently resigned. Mr. Gutierrez is former chief of the National Credit Dept. of the Ministry of Finance.

Thomas C. Baker has resigned as director of the Foreign Division, Defense Minerals Administration, to join Canadian Exploration, Ltd., a subsidiary of Placer Development. Mr. Baker, a consulting engineer, will be located in San Francisco, Calif.

George C. Selfridge has resigned as superintendent of the Fresnillo mine, Fresnillo, Zacatecas, Mex. He is now employed by Defense Minerals Administration as chief of the Ferro-Alloys Branch of the Supply Division.

James G. Hardy, formerly mill superintendent for Homestake Mining Co., Winterhaven, Calif., is with Titanium Metals Corporation of America as production foreman at their new plant at Henderson, Nev.

Formerly plant metallurgist at Climax, Colo., for Climax Molybdenum Co., **Edward S. Frohling** is now an engineer with Western Machinery Co., New York, N. Y.

Robert P. Bremner, mining engineer with Youngstown Sheet & Tube Co., has been named assistant to the vice president in charge of operations of the company.

The M. A. Hanna Co. is promoting **John Orazem** to pit foreman Cooley district, Nashwauk, Minn., and **Eric Fiorini** to foreman of conveyors at the Morton mine, Hibbing, Minn.

Russell B. Wortley, Iron River, Mich., has retired from M. A. Hanna Co.'s employ after 38 years. Mr. Wortley was superintendent of the Hiawatha mine, No. 1 and 2 shafts. A graduate of Michigan College of Mining and Technology, he joined the Hanna company in 1913 as an engineer. **Duane S. Meyers**, formerly superintendent of the Ozark Ore Co. Mine at Arcadia, Mo., will replace him.

H. A. Johnson has resigned as mill superintendent for Vermont Copper Co. in South Strafford, Vt., to accept a resident managership for Galigher Co. in their uranium-vanadium mill. The mill, in Monticello, Utah, is being operated for the AEC.

Harold S. Worcester is now executive vice president and general manager of King Lease, Inc., Ouray, Colo.

S. J. Ireland, supervisor of mine planning for Hollinger Consolidated Gold Mine, Ltd., Timmins, Ont., is now mine engineer. Other promotions are: **Fred Jackson**, projects engineer, to plant services supervisor. **William S. Jelbert**, methods engineer, to master mechanic, replacing **Walter Greaves**, retired. **F. C. Butler**, development supervisor, to planning department supervisor. **E. N. Ward**, senior development engineer, to development supervisor. **W. Carson Millar**, shift boss, to mine foreman.

Dr. J. R. Van Pelt, president of the Montana School of Mines and director of the Montana Bureau of Mines and Geology, has been appointed by Governor John W. Bonner as an advisor to the Montana State Land Board on the allocation of mineral-bearing land.

L. H. Hart, formerly assistant general manager of the Western mining department, American Smelting & Refining Co., Salt Lake City, has been transferred to New York as resident engineer.

ROY H. GLOVER, Butte, Mont., has been elected a director, vice president and general counsel of the Anaconda Copper Mining Co. Mr. Glover has been western general counsel of the company since 1945.

Roy A. Bowen, Montreal, Wis., has been named general superintendent of Montreal Mining Co. by Oglebay, Norton and Co., operating agents. He has been assistant superintendent, superintendent, and in charge of operations. **Clarence A. Bjork** succeeds Mr. Bowen as superintendent. **Charles F. Guen-**

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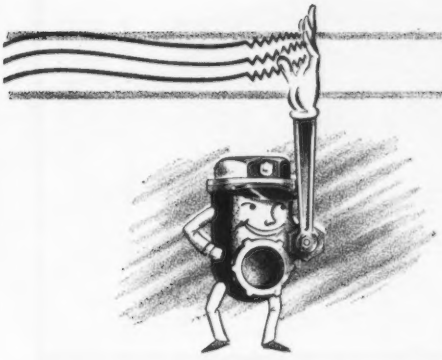
JENKINS



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125 lbs. Steam
200 lbs. O.W.G.
¼" to 2"

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- Dish-washing equipment
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SINCE 1864 TRADE JENKINS MARK

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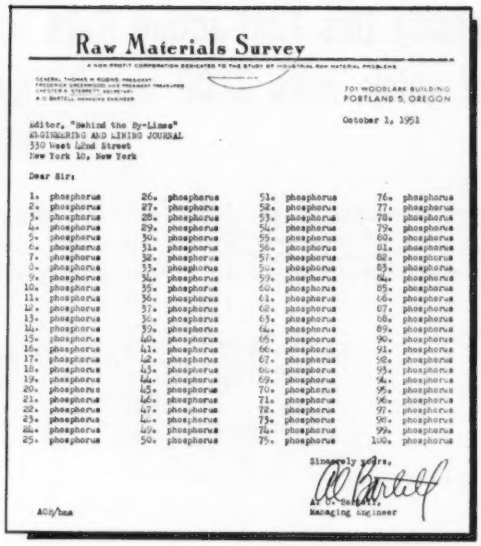
LETTERS TO THE EDITOR

Do you remember this item in "Behind the Bylines" in September?

» "Phosphorous Phosphorous Phosphorous!!!"— That's the way an interesting little item was headlined in a recent mineral bulletin which came across our desk. To which we say "No, No, No!!!" You don't spell it with an "ous". It's "Phosphorus, Phosphorus, Phosphorus!!!" At least that's what Webster says, and he doesn't even give you a choice if you mean the noun phosphorus. It's surprising how often authors, engineers, news correspondents and even some of the editors around our shop will slip up on this—that is until our alert copy editor catches the error. And while we are speaking about misspelled words, here's another one that might trip you up: "Liquefy." It's spelled with an "e" instead of an "i".

Well here is the reply we received from our friend, A. O. Bartell, managing engineer of Raw Materials Survey. (We think it is about the wittiest letter ever mailed to us.)



Raw Materials Survey

A NON-PROFIT CORPORATION DEDICATED TO THE STUDY OF INDUSTRIAL RAW MATERIAL PROBLEMS

GENERAL THOMAS M. ROBINS, PRESIDENT
FREDERICK GREENWOOD, VICE PRESIDENT-TREASURER
CHESTER A. STARRETT, SECRETARY
A. O. BARTELL, MANAGING ENGINEER

701 WOODLARK BUILDING
PORTLAND 5, OREGON

October 1, 1951

Editor, "Behind the By-Lines"
ENGINEERING AND MINING JOURNAL
330 West 42nd Street
New York 18, New York

Dear Sir:

1.	phosphorus	26.	phosphorus	51.	phosphorus	76.	phosphorus
2.	phosphorus	27.	phosphorus	52.	phosphorus	77.	phosphorus
3.	phosphorus	28.	phosphorus	53.	phosphorus	78.	phosphorus
4.	phosphorus	29.	phosphorus	54.	phosphorus	79.	phosphorus
5.	phosphorus	30.	phosphorus	55.	phosphorus	80.	phosphorus
6.	phosphorus	31.	phosphorus	56.	phosphorus	81.	phosphorus
7.	phosphorus	32.	phosphorus	57.	phosphorus	82.	phosphorus
8.	phosphorus	33.	phosphorus	58.	phosphorus	83.	phosphorus
9.	phosphorus	34.	phosphorus	59.	phosphorus	84.	phosphorus
10.	phosphorus	35.	phosphorus	60.	phosphorus	85.	phosphorus
11.	phosphorus	36.	phosphorus	61.	phosphorus	86.	phosphorus
12.	phosphorus	37.	phosphorus	62.	phosphorus	87.	phosphorus
13.	phosphorus	38.	phosphorus	63.	phosphorus	88.	phosphorus
14.	phosphorus	39.	phosphorus	64.	phosphorus	89.	phosphorus
15.	phosphorus	40.	phosphorus	65.	phosphorus	90.	phosphorus
16.	phosphorus	41.	phosphorus	66.	phosphorus	91.	phosphorus
17.	phosphorus	42.	phosphorus	67.	phosphorus	92.	phosphorus
18.	phosphorus	43.	phosphorus	68.	phosphorus	93.	phosphorus
19.	phosphorus	44.	phosphorus	69.	phosphorus	94.	phosphorus
20.	phosphorus	45.	phosphorus	70.	phosphorus	95.	phosphorus
21.	phosphorus	46.	phosphorus	71.	phosphorus	96.	phosphorus
22.	phosphorus	47.	phosphorus	72.	phosphorus	97.	phosphorus
23.	phosphorus	48.	phosphorus	73.	phosphorus	98.	phosphorus
24.	phosphorus	49.	phosphorus	74.	phosphorus	99.	phosphorus
25.	phosphorus	50.	phosphorus	75.	phosphorus	100.	phosphorus

Sincerely yours,

A. O. Bartell
Managing Engineer

AOB/hma

---

ther has been appointed assistant superintendent, and **Thomas P. Rowe** is mining captain.

Thomas A. Evans, of the U. S. Department of Mines, is inspecting mining in Mexico, at the invitation of the Mexican Government, with a view to arranging U.S. aid for the industry. The project is in conjunction with the Point 4 Program. Mr. Evans was for 10 years mill superintendent at the Avalos smelter, Zacatecas.

William J. Welch has been appointed manager of National Lead Co.'s metal department. Since 1947 Mr. Welch has been manager of the metal sales department. He is also chairman of the company metal sales committee.

The Brazilian Geological Society has elected the following officers for the term September, 1951, to November, 1952:

President—**Prof. Octavio Barbosa**
Vice President—**Prof. Othon Henry Leonardos**
Vice President—**Prof. Frederico Waldemar Lange**
Secretary—**Prof. Rui Ribeiro Franco**
Treasurer—**Prof. Alceu Fabio Barbosa**
Director of Publications—**Prof. Josué Camargo Mendes.**

Earl C. Herkenhoff, formerly field engineer with the American Cyanamid Co., has joined the staff of Pickands Mather & Co. at Hibbing, Minn.

The new operation on the Gogebic range of the Puritan Mining Co. will be named the "Peterson Mine" for **Arthur F. Peterson**, vice president, mining division, Bethlehem Steel Co.

Arnold Hill, Hibbing, Minn., has been appointed superintendent of the Sargent and Agnew underground iron mines, Cleveland-Cliffs Iron Co., on the Mesabi range.

G. L. Brazier, Hibbing, Minn., engineering department of the Oliver Iron Mining Co., has been transferred to the firm's engineering office at Ironwood, Mich. on the Gogebic range.

FRANK W. CHAMBERS has been appointed to the executive staff of Kennecott Copper Corp., New York, N. Y., as director of engineering. He was formerly production manager of the engineering and construction division, Koppers Co.

James Nicholls, Ishpeming, Mich., chemist in the assay laboratory of the Cleveland-Cliffs Iron Co., has retired after 49 years with the company.

H. E. Farnam, Jr., has been advanced by M. A. Hanna Co., Hibbing, Minn., from supervisor of mobile equipment to assistant superintendent of the Perry and Mississippi group of mines. **John Bemis** has left the engineering department to serve as assistant superintendent of the Carlz and Section 18 mines.

Earl S. Mollard, Hibbing, Minn., has been appointed assistant general manager of Minnesota iron mining operations of M. A. Hanna Co.

W. A. Pakkala has been appointed district superintendent of mines for the Cleveland-Cliffs Iron Co., on the Mesabi iron range. He succeeds **R. M. Belliveau**, who has resigned.

John J. Foucault, Nashwauk, Minn., has been appointed superintendent of the Holman iron mine, Taconite, Minn., by the Cleveland-Cliffs Iron Co.

George A. Komadina has been appointed assistant mill superintendent of Eagle-Picher Mining and Smelting Co.'s Central Mill at Cardin, Okla.

Stanley J. Maleska, Ironwood, Mich., engineer at the Geneva iron mine, Gogebic iron range, has been transferred by the Oliver Iron Mining Co. to the Hibbing, Minn., engineering offices of the company on the Mesabi iron range.

M. W. Cox is now chief geologist for the Northwestern department of American Smelting & Refining Co. at Wallace, Idaho.

Keith Whiting, Wallace, Idaho, who has been named chief exploration engineer for American Smelting & Refining Co. at Salt Lake City, Utah, was formerly chief geologist for the company's Northwestern department.

(*Continued on page 117*)

RAW MATERIAL shortage will never hit the Northwest Magnesite Company's Cape May, New Jersey plant, for its basic source of supply is seawater—its basic end product, magnesia. In this utilization of modern processing techniques to tap the virtually unlimited chemical resources of the sea, sedimentation is of primary importance.

At Cape May, the jobs of preliminary treatment of seawater and subsequent thickening and washing of magnesium hydrate are carried out in Dorr Thickeners—six of them, ranging from 150 to 320 feet in diameter.

It is particularly significant that these steps are handled by Dorrs at every major seawater magnesia operation in the U. S. . . . regardless of whether the end product is refractory, metal or both.

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WEMCO Sand Pumps are designed for uninterrupted service — built to stand up under the toughest operating conditions. Careful engineering has eliminated parts subject to sudden failure. Abrasive action has been limited to four extremely hard, slow-wearing parts, and replacement is easy (at the operator's convenience) when pumping efficiency begins to drop.

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1 **External slippage adjustment** keeps correct runner clearance.

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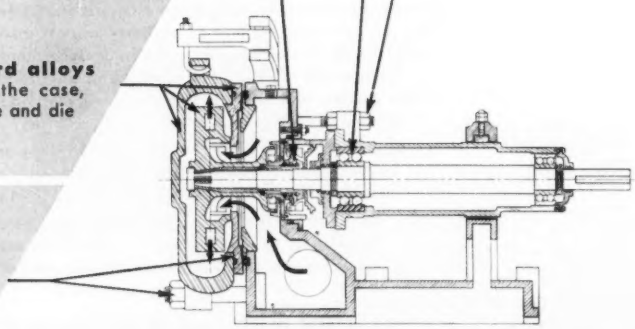

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OBITUARIES

George C. Crangle, retired mining engineer and former resident of Butte, Mont., died in San Francisco, Calif., on Oct. 1. He was employed by the American Metal Co. in South America and a number of years ago was prominent in Montana operations.

Guy H. Richardson, 72, engineer and highly respected Helena, Mont., citizen for more than 30 years, died on Sept. 3. He served as chief assayer at the old U. S. Assay Office in Helena from 1919 until that institution closed, after which he was on the staff of the Montana Highway Commission.

George Wesley Browning, one of the organizers of the old Silver King Consolidated Mining Co. died Oct. 11 in Salt Lake City at the age of 83. He was a native of Utah, and was first employed by the Rio Grande Western Railway. From 1890 until 1903 he was active in organizing the Silver King company which operated in the Park City district, serving as its secretary and director until it was sold to Silver King Coalition in 1924. He was retained in an executive capacity by the new concern until his retirement in 1938.

Chester A. Fulton, former president of AIME, passed away on Oct. 16. Mr. Fulton, a graduate engineer of mines, served as a consulting engineer for Davison Chemical Corp., Baltimore, Md. He then became vice president of the Southern Phosphate Corp., Baltimore. He was made president in 1932 and retired in 1945.

Idaho's great mining statesman, **Donald A. Callahan,** 76, died of a heart attack Oct. 26 in Los Angeles, Calif. He was attending the convention of the American Mining Congress, of which he was first vice president. President of Callahan Consolidated Mining Co. and Eastern Lead Co., Mr. Callahan was an outstanding example of a self-made man. He was Idaho state senator for six terms, chairman of the Senate Finance Committee, state comptroller, and only narrowly defeated when he ran for U. S. senator.

Henry W. Gould, prominent West Coast mining engineer, passed away Nov. 4 in Redwood City, Calif. He was founder-president of H. W. Gould & Co., San Francisco. Mr. Gould was a member of the American Institute of Mining and Metallurgical Engineers and the Engineers Club of San Francisco.

Walter P. Carroll, of National Lead Co., died suddenly in Chicago, Ill., on Oct. 20 at the age of 59. Mr. Carroll had been with National Lead for 41 years, and in addition to being a vice president and director, was also manager of the metal department and of the Chicago Branch.

R. J. Ennis, who retired recently as general manager of McIntyre Porcupine Mines, Schumacher, Ontario, after nearly 40 years' service, died Oct. 5.

William C. Scott died at his farm in Hudson, Ohio, on Oct. 11 at the age of 69 after a long illness. Mr. Scott had been secretary of The M. A. Hanna Co. since 1937. He had worked his way up in the company from stenographer, studying nightly at Cleveland Law School.

John J. Burke, Hibbing, Minn., assistant mining engineer at the Susquehanna mine, Republic Steel Corp., died Sept. 29. He had been employed at the Susquehanna since 1914.

Daniel M. Valdes, 65, resident manager in Laredo of the Peñoles Mining Co., died last month in Laredo. Mr. Valdes, an attorney, was a lifetime resident of Laredo.

John S. Butler, 76, veteran mining engineer in Mexico, passed away Sept. 21 in Guanajuato City, Guanajuato, after a long illness. He was born in Indianapolis, Ind., son of a president of Butler University and grandson of its founder. Mr. Butler came to Mexico 50 years ago. He was long associated with The Fresnillo Co., Fresnillo, Zacatecas, and the Towne interests.

Garnett Alfred Joslin, mining engineer, died suddenly in Mexico City, Sept. 20, at the age of 68. At the time of his death he was serving as manager of Towne Securities Co. Prior to that he was a mining consultant and an associate member of Behre Dolbear & Co. Mr. Joslin was a member of the AIME, Mining Club of New York and the University Club of New Mexico. He received his B. S. from Massachusetts Institute of Technology.

Appreciation

Walter Lyman Brown

On September 5, 1951, Walter Lyman Brown passed away in Carmel, Calif. He was a graduate of the University of California in 1903, and started his mining career under F. W. Bradley of San Francisco. His practical experience was gained in Mexico, in the mines of California, Bunker Hill & Sullivan in Idaho, and Treadwell mine in Alaska. From there he went to South Africa at the request of W. W. Mein, where he spent three years at the New Modderfontein and Crown mines. Later he went to the Gold Coast, West Africa, as assistant manager (later manager) of the Abboutiakoon mine.

After the outbreak of World War I Mr. Brown offered his services to the Allies. In 1916 he joined the Commission for Relief in Belgium organized by Herbert Hoover. He served devotedly in this work, having complete charge of shipping at Rotterdam and transfer of food into Belgium

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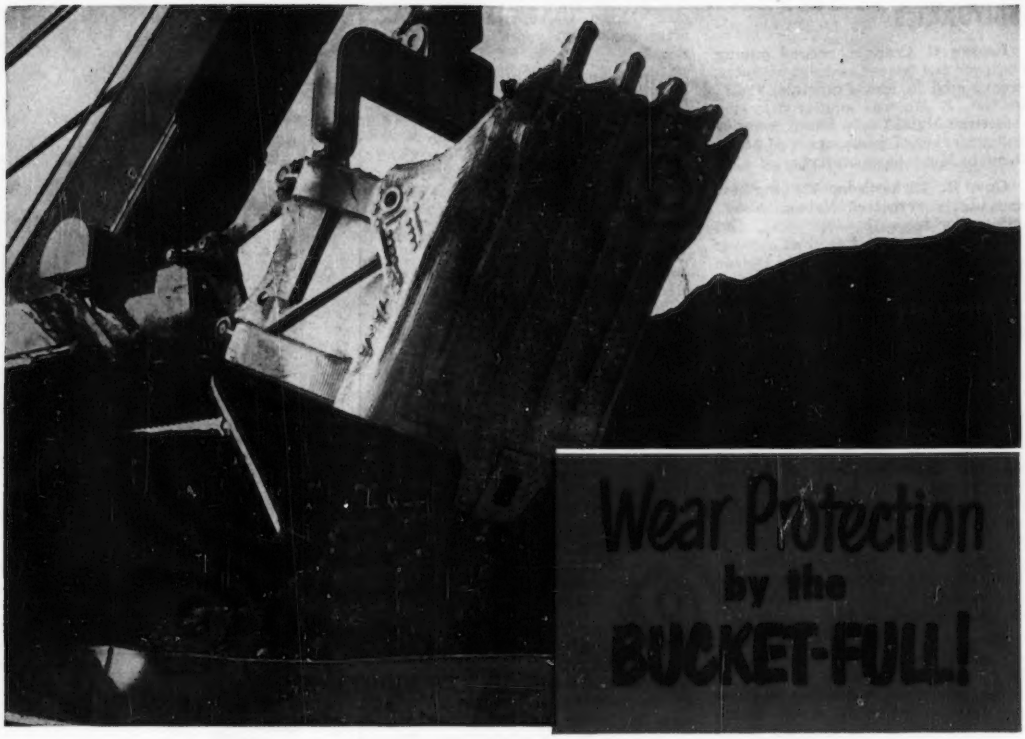

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STOODY

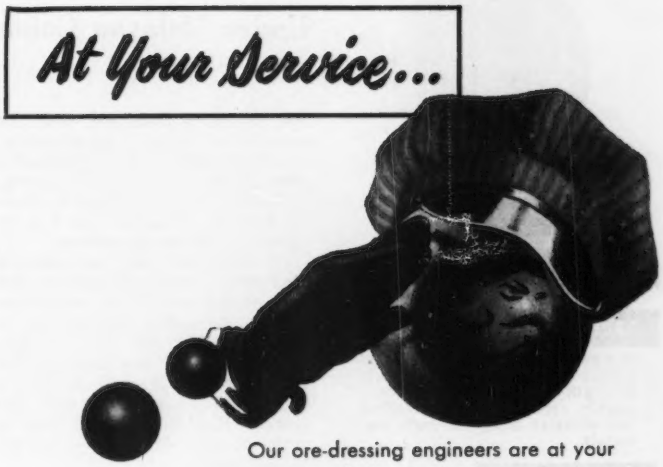
SELF-HARDENING 21

and northern France. Also, he conducted many delicate negotiations with the ministers of England, France, and Belgium in the Hague during the war years. Mr. Brown was perhaps one of the very few sent into German territory during the war on an American passport. After the Armistice he continued the work of relief (which now included rehabilitation of enemy countries) and supervised from headquarters in London the work established in Austria, Germany, Poland Czechoslovakia, and Hungary. Frequent trips were made to these countries, resulting in establishment of personal relations with heads of governments including Admiral Horthy of Hungary and Thos. G. Masaryk, Czechoslovakia's first president.

Perhaps the most dramatic episode of this phase of Mr. Brown's work was his negotiation with Maxim Litvinov of the then Russian Government for relief of the famine in Russia in 1920 after Maxim Gorky sent his appeal for aid to the United States. Mr. Brown, at the request of Herbert Hoover, with a few assistants went to Riga to meet the Bolshevik representatives, working there for 10 days on what might be called a "treaty" covering every detail of future operations in Russia which were destined to develop on a large scale. This was the first contact that Russia had formed with the world since the 1917 Revolution. He was in charge of this work in London until it ended in early 1923. In this and his later work in Russia he negotiated with most of the early revolutionary leaders. Afterward Mr. Brown returned to the mining field and concluded negotiations for Lena Goldfields Co. and Aluminum Company of America. He was well fitted for this sort of work as he had a strong sense of justice and fairness, and could always see the other man's point of view.

In 1934, Mr. Brown returned to his native state, California to become president of Carson Hill Gold Mining Corp. on the Mother Lode, and later, in association with A. O. Stewart, to develop and operate Know Hill Mines, Inc., in the state of Washington. He had long been a member of AIME and the Mining and Metallurgical Society of America. He served on the Alumni Council of the University of California for several years, acting as its adviser on finance. For his relief work Mr. Brown was decorated by the French, Belgian, Austrian, and Polish governments, and received letters of appreciation from Czechoslovakia and individual Russians. He was always deeply interested in world affairs, seeing the welfare of the United States as closely bound to that of other countries. He was a constant worker for peace in his understanding of the problems of other countries.

EDWIN LETTS OLIVER



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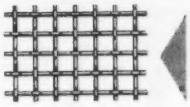

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SALES AGENTS
Representing Producers and Shippers of
FERROUS & NON-FERROUS ORES

RUBBER CONVEYOR BELTING

TOUGH COVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength (2500-3000 lbs.). Thoroughly capable of withstanding the abrasive action of bulk materials.

STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply has a 16-19 lb. average friction pull.

FLEXIBILITY—Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following features: troughs easily, runs true on idlers, gouge resistant.

WHY WAIT?
WE HAVE 8" TO 48"

IMMEDIATE SHIPMENT FROM STOCK

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

SEND US YOUR INQUIRIES FOR OTHER INDUSTRIAL RUBBER PRODUCTS.

INQUIRE FOR SIZES NOT LISTED
ELEVATOR TRANSMISSION & V BELTING ALSO IN STOCK

Write for Free Booklet on Installation, Care & Maintenance of Conveyor Belting.

CARLYLE RUBBER CO., Inc.
64 Park Place, New York 7, N. Y.
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What It Means To Mine Tin Under Malayan Communist Attack

(Continued from page 77)

own defensive measures, with the exception of the basic pay of special constables and partial reimbursement for some defense construction. Regrouping of mine labor, by Government directive, has been a large expense at some properties.

Although England has contributed toward military expenses, the bulk of the cost of the anti-Communist campaign, amounting to more than $100,000 U. S. per day since June, 1948, has been paid by the Federation Government. For a little-developed country, only the size of Florida, this has been a major burden. It has to be met by higher taxes.

Increases in mine wages, in power rates, and in the prices of all imported materials and equipment have combined with higher taxes and the special expenses of the Emergency to raise mining costs to unheard-of levels. At the same time, there has been a decline of slightly more than 20% in the average grade of ore mined in Malaya since the war.

After the outbreak of war in Korea, the price of tin rose to an all-time high as a result of scare-buying in consuming countries. A considerable part of this rise was justified by costs now faced by producers in Malaya, and also by comparison with current prices of other base metals such as copper, lead, and zinc. But the rise went on beyond what producers themselves considered sound. It contributed to the general inflation, which in turn added to the rising costs.

Thereupon, with no apparent consideration for the economic factors that boosted Malayan production costs, or the political factors threatening the very existence of the Malayan mining industry, our Washington authorities applied the utmost economic pressure to force down the price of tin.

Last March the United States urged maximum production of tin as a patriotic effort for the Allied cause, and in the same breath leveled unfounded accusations at tin producers as an excuse for attacking the tin price.

U. S. Government monopoly of tin purchases and distribution in this country enabled the RFC, by suspending purchases of tin metal, to force down the world price of tin to levels at which marginal producers in Malaya were caught by swiftly rising costs.

This RFC policy has already caused a critical loss of dollar exchange to the Sterling block, a loss that may have to be made up by American taxpayers in direct aid. If this policy should also force the closing down of many of the Chinese mines, which are the marginal producers in Malaya, it would throw out of work the very labor group most susceptible to Communist influence. This might very well mark a turning point for the worse in the touch and go struggle to prevent the loss of Malaya to Communism.

Outlook Clouded

As things now stand, there is no end, nor any real improvement of the Malayan Communist situation yet in sight. And it will take a marked improvement to make possible the extension of tin mining operations into those areas now closed to development.

Even when extension becomes possible, it will have to wait on a major program of prospecting to provide the ore reserves needed to maintain the current level of production. The best that can be expected in the near future is that the present level can be approximately maintained. So far this year, Malayan tin production has been running slightly below 1950's rate of 57,500 tons for the year. Until there is a definite improvement in the terrorist situation, this incipient decline may well continue.

A delegation from the United States has visited Malaya in November, at the invitation of the Federation Government, to evaluate the tin situation at first hand. It is hoped that their conclusions will lead to a policy in Washington more nearly in accord with the national, and international, interest than that which has been followed since March of this year.

Continuation of Washington's recent actions may have serious consequences for Malaya, an area which is critical to the United States not only as a source of tin, but also as a key position in the front line of the fight against spreading Communist imperialism.

Idaho Cobalt For U. S. Defense

(Continued from page 80)

cleaned once in a separate machine.

Treatment of the mine-run ore starts with two-stage crushing to minus ¾ in., followed successively by: 1, grinding to about 100% minus 10 mesh in a rod mill loaded with 2¼-in. by 11-ft. steel rods; 2, secondary grinding to 65% minus 200 mesh in two ball mills using 2-in. cast balls; 3, conditioning at 90 deg. F; 4, copper flotation, iron flotation, conditioning, cobalt flotation; 5, thickening and filtering of the copper and cobalt concentrates.

These are trucked via Challis to Mackay, the nearest Union Pacific R. R. rail point for shipment to the company's cobalt refinery now nearing completion at Garfield, Utah, and to the near-by Garfield copper smelter of the American Smelting and Refining Co.

At Mackay the concentrates are transferred from the trucks to railroad cars by a mechanical loading system. Electric power for the mine, concentrator, and camp is obtained through Idaho Power Co.'s 69-kv powerline brought in last year from Bannock, Mont.

Many improvements, including construction of additional housing facilities for staff members and single men, have been made at the Cobalt townsite, and quite a number of new houses have been constructed under the company's special finance plan which advances up to $2,500 for building of such dwellings by permanent and skilled workers.

H. H. Sharp is president of Howe Sound Co.; H. A. Pearse, vice president; and V. H. Clarke, executive mining engineer. Edwin B. Douglas, manager, directs operations at Cobalt.

Radioactive Cobalt

Perhaps the most important of the seven radioisotopes of cobalt is Co^{60}. Prepared in an atomic pile from the natural metal (which is 100% Co^{59}), '60' has a half-life of 5.3 years—long enough to allow for use, and yet short enough so that '60' is an intense source of the gamma rays important in treatment of cancer. A relatively cheap amount of '60' will produce one curie of radiation (equivalent to a whole gram of radium). A Toronto hospital recently installed a several-thousand-curie unit, and the Oak Ridge Institute of Nuclear Studies is developing a similar one.

THE NIGHT BEFORE CHRISTMAS

by Jolly Saint "VIC"

'Twas the night before Christmas and right down the line
Not a drop was there leaking, even one at a time.
All sections were "locked" and "buttoned-up" tight
With Victaulic Couplings that made 'em just right.

All Elbows and Tees stayed right in their groove
For the Victaulic Method each fitting did prove.
With the world's best system for making ends meet
Each pipe and each fitting was tight in its seat.

Now all of this piping so good and so quick
Was the work of none other than jolly Saint "Vic"
So for better connections in the year '52
You'd better let "Vic" do that piping for you.

VICTAULIC COMPANY OF AMERICA
1100 Morris Avenue, Union, N. J.
Mailing Address: Box 509, Elizabeth, N. J.
Phone: Elizabeth 4-2141
Victaulic Inc., 727 W. 7th St., Los Angeles 14, Calif.
Victaulic Company of Canada, Ltd., 406 Hopewell Ave., Toronto 10
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27TH VICTAULIC YEAR

The easiest way to make ends meet
VICTAULIC
PIPE COUPLINGS AND FITTINGS

Copyright 1951, by Victaulic Co. of America

Old-timer Nick Pezzente says

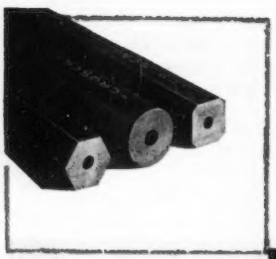
"hard rock, high air pressure, round-the-clock operation calls for

CRUCIBLE HOLLOW DRILL STEELS!"

That's Nick Pezzente, Blaster, Slattery Contracting Company, Inc., tapping a charge in the big hole for the new Chrysler Building Annex in New York City. Slattery Contracting does a major portion of the rock work around the New York metropolitan area, and Nick's an old hand at knowing by experience what it takes in drill steel to do the best job at *lowest cost per foot drilled.* He's been in this business for more than 25 years.

When the job calls for holing out hard rock, that's where Crucible *pretested* Hollow Drill Steels stand up and take it. Fewer lost bits—Crucible Hollow Drill breakage is cut to a minimum by gruelling tests on *every* lot before it gets to you.

And you get an extra when you do business with Crucible—our metallurgists and drill steel specialists can help you with those "special" jobs that take something different in drill steels. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.



CRUCIBLE first name in special purpose steels

51 *years of* Fine *steelmaking* **HOLLOW DRILL STEEL**

HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

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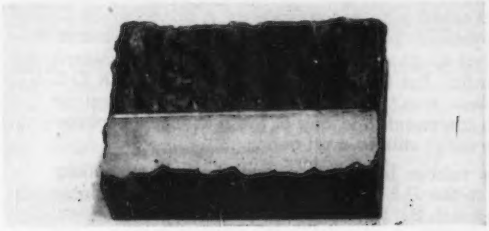
NEW PRODUCTS DIGEST

For further information on these products, circle item number on card—insert and mail.

TWO SENSATIONAL DEVELOPMENTS



TUNGSTEN CARBIDE surface deposited by arc weld on steel can be ground and polished if desired.

Tungsten Carbide Welding Rods; New Chrome Carbide

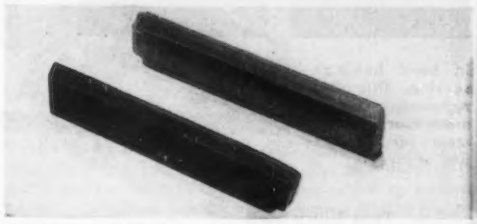
CARBOLOY DEPARTMENT of General Electric Co., Detroit, announced two sensational research developments at the recent Metals Congress show—(1) A tungsten carbide welding rod, and (2) a new carbide containing chrome.

With the new cemented carbide welding rod, it is now possible to coat iron, steel, and possibly other metals with a skin of ultra-hard, wear-resisting tungsten carbide metal. (We wonder how soon it will be before somebody starts touching up a steel bit with this metal.) The hard metal may be applied with shielded arc-welding equipment as shown here. Also note in the illustration above that the carbide surface can be ground or polished if desired.

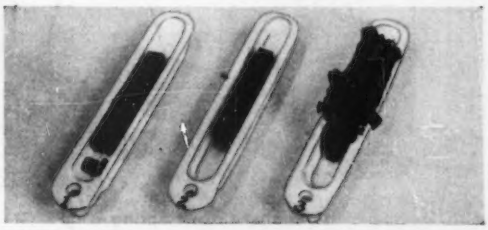
Series 600 chrome carbide is the new hard metal which Carboloy has developed for commercial production. Chrome carbide contains no cobalt or tungsten. Chrome content is about 70%. The new carbide is more heat resistant than stainless steel or tungsten carbide; has much better wearing qualities than tungsten carbide; is about as hard as tungsten carbide (80-93 Rockwell A); is 30 times as corrosive-resistant to sulphuric acid as stainless steel; resists oxidation at all temperatures up to 1,832 deg. F.

In one six-week test, centrifuge blades of chrome carbide showed much less wear than blades of tungsten carbide. Coefficient of expansion is about the same as steel. If you want more information on the tungsten carbide welding rod, circle **No. 1** on the card opposite page 126. For more information on the new chrome carbide, circle **No. 2.**

THIS WELDER is producing a wear-resistant tungsten-carbide surface with Carboloy's new carbide welding rod.

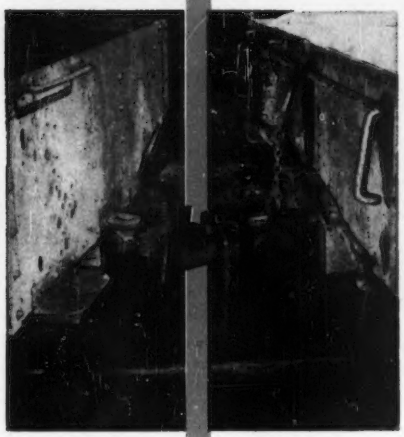


CHROME CARBIDE centrifuge blade (rear) shows little wear after six-weeks' run; but look what happened to the tungsten carbide blade in same test! It wore to a bevel.



AFTER 24 HOURS' exposure in air at 1,850 deg. F., stainless steel (left) and tungsten carbide (right) went to pieces. But the new chrome carbide (center) stood up well.

HOW CAN A COUPLER BE SO TOUGH?

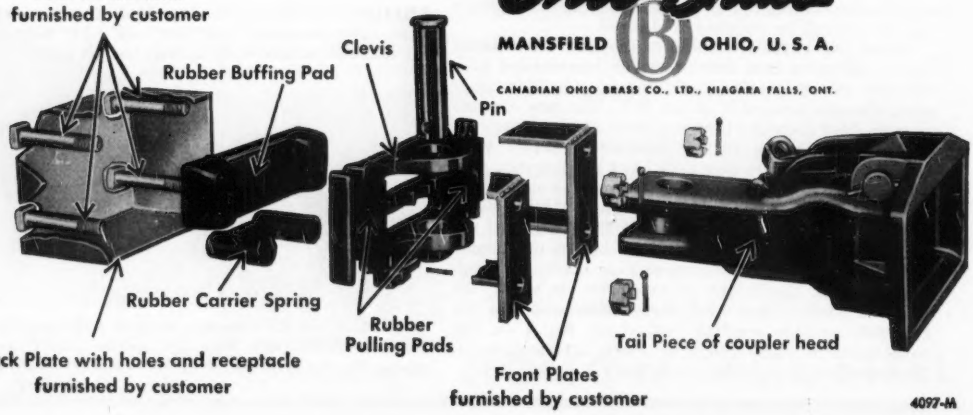


In hard haulage service, this O-B Automatic Coupler meets every requirement for strength and utility.

How do O-B Couplers stand up to the repeated whacks and jolts encountered in a mine car haulage system? To some, it must seem that any coupler has to give sooner or later, for the punishment is terrific. But O-B Coupler owners know that O-B Couplers won't knuckle down under any sort of tough treatment, and one of the reasons is because of the tough rubber draft gear.

The rubber buffing pad and the rubber pulling pads in the O-B Form-8 Coupler can absorb impacts of as much as 100,000 pounds. These pads, shown in the exploded coupler illustration, occupy less space than steel springs, are more resilient, and are not susceptible to the deteriorating effects that steal the strength of steel springs.

Tough, durable O-B Couplers will improve the operation and maintenance of your haulage system. Less time needed for car handling, safer handling, fewer repairs and longer car life are some of the advantages gained from O-B Automatic Coupling. An O-B engineer is ready to study your system and its needs. Let him help with your planning for improved haulage.

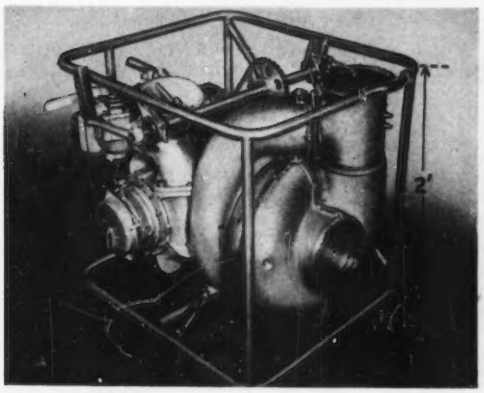

Four 1-inch bolts furnished by customer
Rubber Buffing Pad
Clevis
Pin
Rubber Carrier Spring
Back Plate with holes and receptacle furnished by customer
Rubber Pulling Pads
Front Plates furnished by customer
Tail Piece of coupler head

Ohio Brass

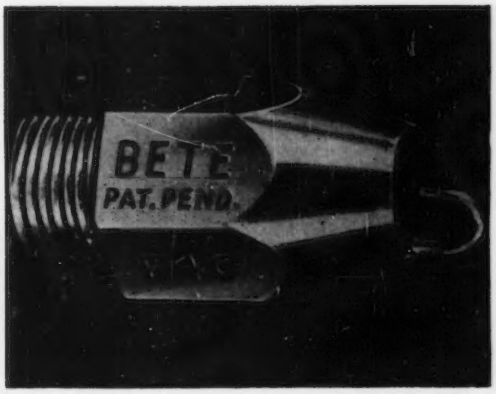
MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

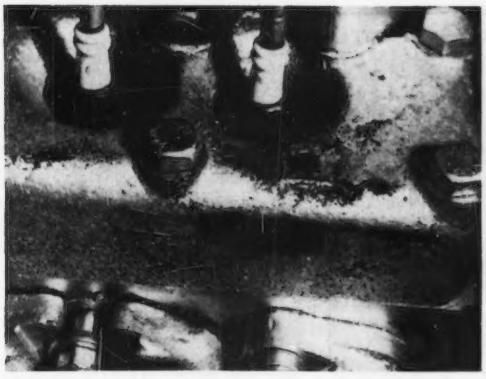
4097-M



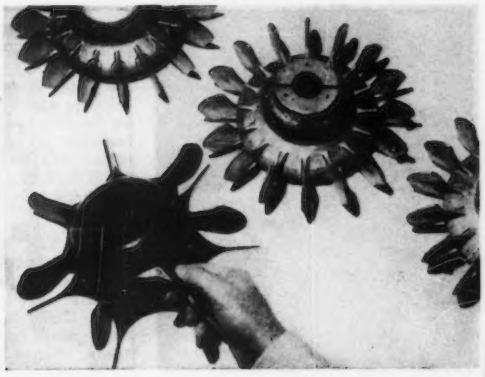
GAS TURBINE. New portable, manual-starting, 45-hp. 40,000 rpm gas-turbine power plant made by Solar Aircraft Co., San Diego, Calif. for the navy is used to power small electric generators and fire pumps. This model operates on diesel fuel, weighs 165 lb. (3)



FOG NOZZLE. Bete Fog Nozzle, Inc., Greenfield, Mass. produces this Series P fog nozzle which can be used to control dust in mines, cool gases, cure concrete, and for chemical processing. Comes in 10 sizes requiring 2 to 100 gal. per hour depending on pressure used. (4)



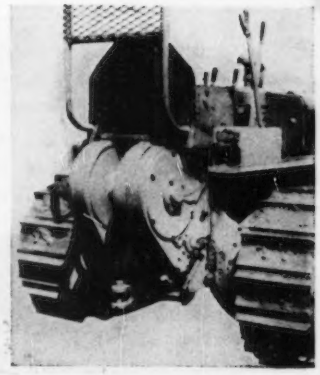
STICK-ON THERMOMETER. Ruge-DeForest, Inc., Cambridge, Mass. announces these new "Stikon" resistance thermometers to measure temperatures on engine parts. Elements are ¾ to 1½ in. long. Price range, $1.85 to $5.00. Temperature range is —100 to 350 deg. F. (5)



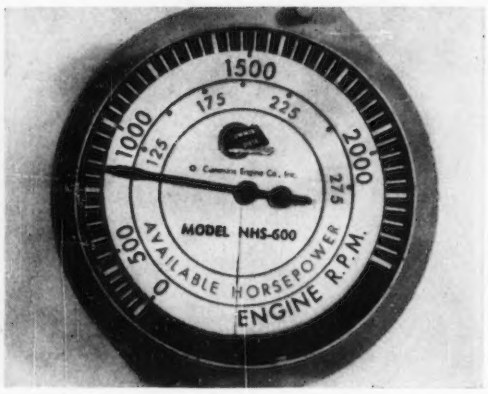
PLASTIC BLOWERS FOR MOTORS. Westinghouse Electric Corp., Pittsburgh 30, Pa. now substitutes plastic blowers for totally-enclosed fan-cooled ac motors. Weight is one-third less than metal types. Blades are resistant to corrosive agents. Ideal for refineries, mills. (6)

METALLIZER. Metallizing Engineering Co., Long Island City, N.Y. offers this new Type 4E gun for repairing and salvaging machine parts. The unit will spray steel, Monel, or stainless steel on worn out pump parts shafts, bearings, etc. (7)

NEW WINCH. Hyster Co., Portland 8, Ore. produces a new D4 Hy-Speed winch for mounting on Caterpillar D4 tractors. The reel handles 335 ft. of ½-in. cable. Line pull is as high as 7,000 lb. at 225 fpm. Line pull based on 48 hp. (8)

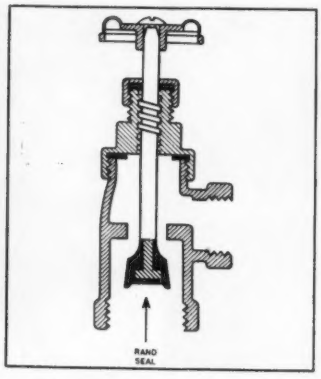


SAFETY POSTER. If any appeal will induce your employees to wear safety goggles, this compelling poster will. Willson Products, Inc., Reading, Pa., offers copies free. For copies circle (9) on the return card, and note down how many you will need. (9)

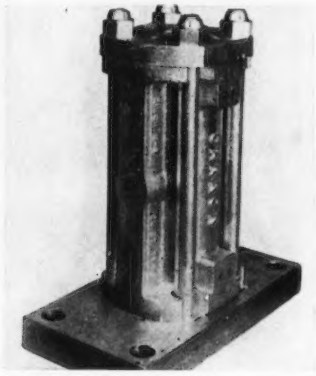


NEW TACHOMETER FACE. Cummins Engine Co., Inc., Columbus, Ind., has developed a new tachometer dial face which not only shows rpm, but also the approximate available horsepower at any instant. This should help drivers considerably and prevent engine lugging. (10)

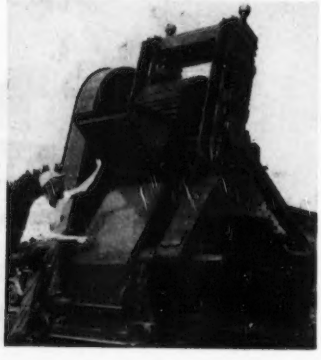
ABSORPTION CELL. Beckman Instruments, Inc., South Pasadena, Calif., announces this new low-cost matched absorption cell for Model B and DU Spectrophotometers. Range is for 320 to 1,000 millimicrons. (11)



VALVE SEAL. Rodic Chemical and Rubber Corp., New Brunswick, N. J. developed this new leak-proof design valve seal using the Rand Seal which works with the fluid flow instead of against it. (12)

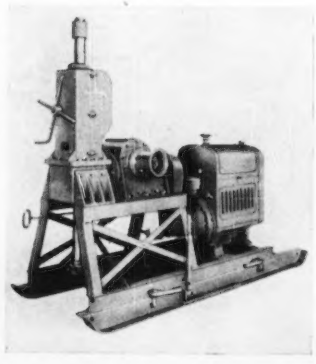


QUIET VIBRATOR. Air cushion impact prevents metal-to-metal pounding in this new "Quiet-Type" vibrator made by Cannon Vibrator Co., Cleveland, Ohio. Piston sizes range from 1¼ to 4 in. (13)



SHOT CORE DRILL. This new Model KR shot core drill by Acker Drill Co., Scranton, Pa. will recover cores up to 20 in. in diameter from depths down to 600 ft. (15)

NEW ROLL CRUSHER. This 54x24-in. triple roll crusher has been added to the line by Pioneer Engineering Works, Minneapolis, Minn. Reduction ranges vary from 6½ to 2 in. to 4 to ½ in. Capacity ranges from 35 to 500 tons per hour. (14)



Equipment Shorts

ELECTRONIC SCALE. These unique devices contain a strain gage bonded by bakelite cement to an accurately-machined load member. When a weight is applied to the load cell, the strain gage introduces a voltage which is translated electronically into weight values. Various types of these units are used to weigh loaded track sections, loads on cranes (the scale is attached to the crane hook), etc. The recorder can be installed at spots remote from the actual weighing site. Thus a mill superintendent could observe dials in his office which would record loads being weighed in yard trucks. Streeter-Amet Co., Chicago 13, Ill., makes the scales. (21)

BELT-TYPE FIRST AID KIT. Mine Safety Appliances Co., Pittsburgh 19, Pa., makes a belt-type first aid kit for civilian defense units which is equally useful for first aid teams at mines. The kit contains gauze roller bandage, adhesive compresses, tourniquet, scissors, forceps, Merthiolate applicator vials, absorbent gauze compresses, gauze pads, MSA Foille burn treatment, triangle bandages, a dermal pencil, an indelible pencil, and injury report cards. The belt also has a clip for holding a flashlight. (22)

RUST PREVENTER. Shell Oil Co., New York 20, N.Y. now offers "VPI" crystals, a slightly volatile amine nitrate which prevents rust and corrosion of metal parts in the presence of air and moisture. The volatile crystals are placed in packaged metals or into areas where metal parts are stored. The vapors diffuse and settle on the parts thereby protecting them from rust. The VPI compound can also be used in water or alcohol and then applied to metal surfaces. (23)

WASHER-DEWATERER. A new compact, small-diameter screw conveyor type washer and dewaterer, called the "Pixie" has been announced by Eagle Iron Works, Des Moines, Iowa. It requires a minimum of floor space and headroom. Practically any material which will not float can be handled by this washer. Materials can be introduced wet or dry. A scalping tank is mounted above the washer to take care of materials in a dilute pulp. This concentrates the solids prior to washing. (24)

MOLYBDENUM LUBRICANT. Molykote is the name of a new lubricant containing molybdenum disulfide useful for lubricating machine tools, thread connections, taps, extreme temperature equipment, aluminum cylinders, pump stuffing boxes, hydraulic cylinders, gears and other equipment parts. Made by The Alpha Corp., Greenwich, Conn. (25)

MATERIALS HANDLING ATTACHMENT. Baker Industrial Truck Division of Baker-Raulang Co., Cleveland 2, Ohio, announces a new four-purpose fork truck attachment which provides (1) standard fork use; (2) clamp action; (3) fork spacing for different load widths; (4) side shifter action. It is available for any standard Baker fork truck from 2,000 to 4,000-lb. capacity. (26)

NEW THROWAWAY BIT MANUFACTURER. Mackintosh-Hemphill Co., Pittsburgh 3, Pa., is starting up a new Drill Bit and Tool Division for the manufacture of "DBT Throwaway" bits for disposal through contractor and mine supply houses throughout the United States and South America. Bit sizes range from 1¼ in. to 2⅝ in. The company will also make a supplemental line of hollow steel drill rods of carbon-manganese-silicon steel designed for the "DBT Throwaway" bits. (27)

PLASTIC SEWER PIPE. A huge vinyl-plastic lined sewer pipe nearly 7 mi. long and over 6 ft. in diameter is being installed in Orange County, Calif. The reinforced concrete pipe is lined with "T-Lock Amer-Plate," a plastic sheeting developed by Amercoat Corp., South Gate, Calif. The plastic sheets, approximately 4x8-ft., are softened and welded into one continuous lining by a hot air torch to provide complete protection for the concrete pipe against corrosive industrial and septic sewage. Ingredients in the lining include B. F. Goodrich Chemical Co.'s polyvinyl chloride resin, inert pigments, and plasticizers. For more information, circle (28)

BALL MILL. Patterson Foundry & Machine Co., East Liverpool, Ohio, has developed a new heavy-duty continuous ball or tube mill, suitable for wet or dry grinding of minerals to fine or coarse sizes. The mill heads are of cast-steel construction slightly conical in shape to provide maximum rigidity. Standard sizes are available ranging from 2 ft. dia. by 2 ft. long, to 10 ft. dia. by 24 ft. long. (29)

STEEL HARDENER. You can put steel hardening metals right into your own tools, dies, bits, cutters, impact tools, chisels, picks, moils, drills, and other parts by a simple inexpensive treatment afforded through the use of "Hi-Speed-It," an easily-applied hardening powder made by Wilson Carbon Co., New York 17, N. Y. This compound introduces activated mineral carbon, sodium, boron, zirconium, manganese, chromium, magnesium, and titanium into steel surfaces through a simple heat treatment process. The compound contains no cyanide. The same company also makes "Willcarbo," which contains the same constituents as "High-Speed-It," and is specially designed for pack-hardening steels. For complete information on the nature of these hardening compounds and photomicrographs showing actual improvement in grain structure which results from such treatment, circle (30)

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For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

SIDE-DUMP BODIES. Easton Car and Construction Co., Easton, Pa., offers a new Catalog No. 2 which illustrates a wide variety of side-dump bodies for trailers, tandem trailers, trucks, and various sizes of mine cars. The catalog also illustrates electric industrial trucks and light cars and trailers for plant materials handling. (35)

SERVICE FOR BUDA ENGINES. You can get fast, efficient service on your Buda engines, and readily-available replacement parts through a nation-wide system of dealers and distributors. Where are these dealers located?—In approximately 100 places all over the United States. If you want a copy of a map and list of these dealers and distributors published by The Buda Co., Harvey, Ill., circle (36) on the card below. (36)

CENTRIFUGAL BLOWERS. U. S. Hoffman Machinery Corp., New York 3, N. Y., has released a very fine bulletin covering their multistage centrifugal blowers and exhausts for smelters and refineries. The booklet includes handy charts and graphs which help you solve capacity and friction loss problems in blower installations. (37)

HOW TO TAME A TORQUE. One of the biggest problems of equipment operators is to prevent powerful torque developed by engines and motors from tearing the equipment apart due to ineffective transmission units. Twin Disc Clutch Co., Racine, Wis. offers you "Production Road," a 32-page booklet showing how torque converters and clutches can be used to eliminate jerks in the operation of locomotives, trucks, tractors, pumps, shovels, boats, cranes, drilling rigs, compressors, feeders, rock conveyors, crushers, etc. (38)

GADGETS. The Scientific Apparatus Makers Association publishes a directory of makers of industrial instruments and laboratory equipment listing major items of each manufacturer. Here are some of the items included: lie detectors (not recommended for fishermen), tachometers, hygrometers, thermometers, psychrometers, manometers, flowmeters, Geiger counters, radiation instruments, visible and infrared spectrophotometers, laboratory crushers, samplers, amalgamators, density controllers, and hundreds of others of special interest to mine, mill, and smelter operators. (39)

SLACKLINE EXCAVATORS. Sauerman Bros., Inc., Chicago 7, Ill. offers Catalog Section C which is really a good handbook on materials handling with slackline cableway excavators. It contains dozens of drawings and photographs showing how to rig up earth-moving cableways for mine, pit, quarry, and stockpiles. (40)

SEALER FOR LINER BOLTS. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. describes a molded-rubber liner bolt sealer for wet grinding, ball, rod, and pebble mills to minimize drip. (41)

HAMMERMILLS AND IMPACTORS. Pennsylvania Crusher Co., Philadelphia 7, Pa. publishes a beautifully illustrated booklet "Crushing in the Aluminum Industry," containing an instructive flowsheet for processing bauxite from ore to alumina. Cross-sectional views and photographs of Pennsylvania reversible hammermills and impactors are included. (42)

DENSER CONCRETE. Heat-Crete, made by Lee-Don, Inc., Harmarville, Pa., is a product which increases density of concrete; improves structure of concrete; increases thermal conductivity; increases wearing qualities; decreases water used in making concrete; increases strength of concrete; and provides a better finish on concrete. What more could you ask? Looks like you can't afford to overlook this one for your files. (43)

MOTOR-SCRAPER. LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa has issued a new catalog describing their Model TS300 Motor Scraper, a high-speed, rubber-tired, self-propelled earthmover. (44)

VANE - TYPE ROTARY PUMP. Worthington Pump and Machinery Corp. releases Bulletin W-485-B1 on a new heavy-duty, vane-type rotary pump. Pipe openings range from 2 to 12 in. on the suction side; capacities from 25 to 1,000 gpm; and speeds from 850 to 210 rpm. They are especially suited for non-lubricating liquids such as gasoline. (45)

THERMOCOUPLES. A new catalog "Pyrometer Supplies" by Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa., is a descriptive handbook covering a complete line of thermocouples for measuring temperatures from —300 to 3,400 deg. F. (46)

TOTALLY ENCLOSED MOTOR. Construction details of a totally-enclosed, fan-cooled motor (Type APZ) made by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., are given in a newly released Bulletin 51B7225. These corrosion-resistant units come in sizes from ½ to 100 hp., speeds from 600 to 3,600 rpm. (47)

CHEMICAL PRICE LIST. Merck & Co., Inc., Rahway, N. J., has issued its 1951 laboratory chemical price list giving purity, packaging, and prices for over 600 reagents and chemicals of interest to assayers and chemists in the mining industry. (48)

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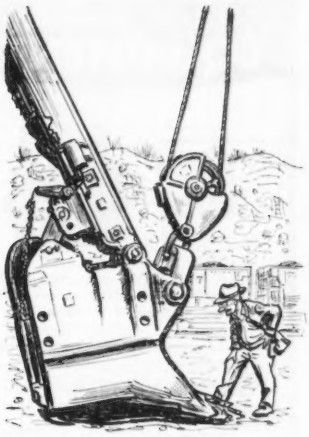

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metals (it is a hydro process) and precipitation of the metals as separate powders.

Asbestos Find May Be Geological Clue

Though it sounds like small potatoes, a new $5000 asbestos-exploration contract between DMA and the Star Mining Co. of Madison, Wis., adds support to a growing theory that a sequence of minerals found in Canada repeats itself in the Great Lakes area.

Star Mining will strip the overburden around a small outcrop containing chrysotile asbestos on the Herriman farm about 7 mi. west of Nathan, Mich. The company will strip to a maximum depth of 20 ft., will finish the job in 90 days, and will repay the Government through royalties in the next 10 years.

New Metals Uses Seen By Metallurgical Congress

The changing role of certain metals was emphasized at the World Metallurgical Congress in Detroit, Mich., last month.

Molybdenum, which is in far more plentiful U. S. supply than metals for which it will be substituted, was disclosed as being ready for jet-engine manufacture.

Chrome carbides, developed by the Carboloy Dept. of General Electric Co., are super-hard compounds which were reported to be more efficient than tungsten carbides.

Boron, "Queen of the Metal Industry," as Chrysler Corp. metallurgist Walter E. Jominy called it, was exhibited publicly for the first time. An ounce of boron added to a ton of steel cuts the need for other less-available ingredients nearly in half. And at Boron, Calif., Pacific Coast Borax, the Twenty-Mule Team company, has ample reserves of borate ore.

Titanium is the metal to watch, according to all experts discussing the future of metals. As Dr. Zay Jeffries, director-general of the Congress put it, "This metal is more prevalent in the earth's surface than copper. The steel parts of planes and all light steel construction may be replaced with this metal."

Sonic Depth-Finder Aids Passamaquoddy Project

The USGS and Army Engineers killed two birds with one stone this summer: They conducted a sonic survey to determine the depth, thickness, and nature of underwater formations at Passamaquoddy off Eastport, Me. USGS tested geophysical possibilities of a Navy sonic unit. Army Engineers got a set of results which, though not completely interpreted, have brightened the outlook for the Passamaquoddy power project. The original 1935-36 surveys indicated a thick burden of unconsolidated sediments. The sonic survey indicates that those sediments were largely confined to the area where the 1935-36 survey was made, and that sites for important structures (dams, etc.) have solid bedrock much closer to the water bottom than was thought.

William O. Smith, USGS physicist, was in charge of the survey. Using a freighter-borne Navy Edo Corp. depth-finder, the field work was completed in two weeks by 10 men—work which by coring would have taken six months at a cost of $2-million. The instrument indicated depth to mud, glacial debris or other unconsolidated overburden, and finally to bedrock. It also revealed a fault—the first ever located with sonic equipment of this kind.

Guatemala May Liberalize Mining Code

The little republic of Guatemala is now considering revisions in the National Mining Code enacted in 1934. Non-Guatemalan capital has often considered certain sections of the Code "too restrictive." Observers predict that approval of pending changes will bring on an early expansion in the republic's mineral industry.

Until recently, mining was limited to primitive, small-scale operations carried on by Indians. In the last two years, despite the Code, several new mines have been financed by foreign capital and put into production. Result: Mineral production rose from $315,000 in 1949 to $1,018,000 in 1950; and to more than $1-million in the first half of 1951. Major known resources include lead, silver, copper, zinc, chromium, iron, and bismuth.

The largest mine, near Coban in northern Guatemala, is operated by Compania Minera S. A., a Guatemalan organization controlled by Allan Hoover and associates, and run in Guatemala by Ben Johnson, executive vice president and general manager. To date, the company has spent more than $1.5-million for exploration, development, and equipment. It is now producing about 2,000 tons of lead and zinc concentrates monthly. An additional $1.5-million for milling, powerplant, and mining equipment will be needed to bring the operation up to its planned capacity of about 6,000 tons of concentrates monthly.

A Houston, Tex. mining group is investing $1½ million, and in late 1951 several other U.S. investors have opened negotiations for mining rights.

Copper Range Gets Green Light on White Pine

Having received RFC approval of a $57,185,000 loan, Copper Range Co. is preparing to develop the White Pine Copper deposit in the Northern Peninsula of Michigan. The loan will go to White Pine Copper Co., a Copper Range operating subsidiary. The entire program includes development of the mine, building of a concentrator, smelter, town, power plant, and railroad to Ontonagon. Production will start in late 1954, and will reach 10,500 daily tons of ore (35,000 annual tons of copper).

Reserves. The orebody is 5 mi. long, 2½ mi. wide, and contains 309,660,000 proven tons averaging 21.3 lb. of copper per ton. (It contains more known copper than any undeveloped property in the U.S.—about 3.3 million tons—a little more than San Manuel's known reserves.)

Mechanized Mining. At White Pine, the total ore column is 16.5 ft. high. Initial mining will be by room and pillar in the lower 10 ft. of that column, which averages 24 lb. of copper per ton. (In an experimental stope 60 ft. wide by 200 ft. long by 10 ft. high, the back is holding well.) Broken ore will be loaded into diesel trucks for haulage to chutes spaced at 3,000 to 4,000 ft. intervals. Chutes will direct the ore to conveyor belts 150 ft. below the plane of the orebody, from where slope conveyor belts will carry it to the surface. To operate with standard-height diesel trucks, Copper Range would have to provide passageways of greater height than the stope. So the company (40 W. 40th St., New York) is looking for a source of heavy-duty diesel haulage units about 5 ft. high.

Regrind Concentration. Metallurgical tests, which are still being run, point to rougher flotation after a 65-mesh grind. The rougher concentrate, 3 to 5% copper, will then be reground to 325 mesh and floated for an 86% recovery in a 35%-copper concentrate.

Belt-Fed Furnace. In the smelter, concentrate will be belt-conveyed from storage bins to a top-fed reverberatory furnace. Two 13 by 30-ft. converters and a fire-refining furnace will produce a Lake-grade copper with 15 to 20 oz. of silver per ton.

Iron to be Recovered from Michigan Jasper in New Project by Cleveland-Cliffs, Ford

Mining and beneficiation of Michigan's iron-bearing jasper, a hard, fine-grained material lean in iron and high in silica and comparable economically to Minnesota's taconite, is to be undertaken shortly in a joint enterprise by Cleveland-Cliffs Iron Co. and Ford Motor Co. The iron in the jasper to be mined is in the form of hematite. This will be the first undertaking to utilize the jasper commercially.

The property, dormant since 1920, is at Humboldt, Mich., on the Marquette Range and will be known as the Humboldt mine. To operate it, a new company owned jointly by Cleveland-Cliffs and Ford will be formed. Concentrating capacity will be provided to yield 400,000 tons of concentrates per year. The product will be substantially higher in iron than the Lake Superior ores now being mined commercially.

Development will begin immediately. Capacity production is expected late in 1953. Shipment of concentrates to Ford will start as soon as the first unit is completed. Ford will mix these concentrates with the feed in their new sintering plant to produce enriched sinter. A second unit of the same capacity is expected to be in operation by 1955. Later on a pelletizing plant is to be erected to supply both open-hearth and blast furnaces.

Approximately 1,100,000 tons of direct shipping ore was mined from the Humboldt property between 1865 and 1920. In 1896 Thomas A. Edison spent time and money at Humboldt in building and running an experimental magnetic separation mill. A fire destroyed the plant before definite results were obtained and it was never rebuilt. Little more was done until 1947 when Cleveland-Cliffs began exploring the area to determine the extent of the low-grade and methods of utilization.

In 1949 diamond drilling, financed by Cleveland-Cliffs and Ford, established that a sufficient tonnage of crude material existed. Cleveland-Cliffs built a research laboratory at Ishpeming to develop economic methods for processing the lean ores which it owned. The work at this laboratory established a process for concentrating the lean Humboldt ores. On the basis of field samples Cleveland-Cliffs acquired a large acreage by ownership or lease.

Simplot Does it Again—New Iron Mine in Nevada

J. R. Simplot, the Burley potato king, the man who organized 45 corporations in the last 15 years, has moved rather quietly into iron with a substantial new open-pit mine in Nevada. Operation of the mine is in the name of J. R. Simplot Iron Mines, Inc., which holds a lease on claims estimated to contain 30 million tons 26 mi. from Palisades in Eureka County, Nevada.

Simplot Iron has installed a crusher plant uses three power shovels to load the ore, and hauls it with a fleet of 46 trucks to a siding on the Western Pacific. Sent by rail to port at Oakland, Calif., the ore is then shipped to Japan. **Simplot Iron currently ships 20 to 30 carloads of 56% iron ore daily.**

Western Pacific has run preliminary surveys for a spur line to the iron mine. **And Simplot is planning to coordinate other iron-ore mines in Nevada, Utah, and southern Idaho—many of which are also selling ore to Japan—and to build a steel mill somewhere along the Western Pacific line in northern Nevada.**

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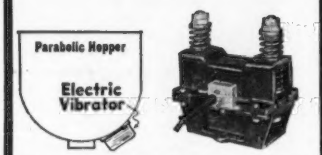

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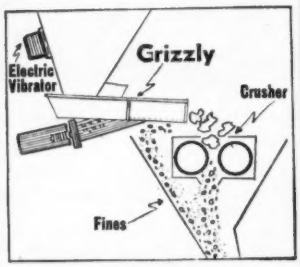

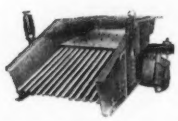

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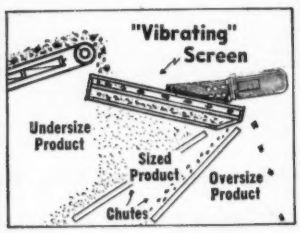

VIBRATING SCREENS screen material wet or dry with single or multiple decks; used to size the product.

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IN THE UNITED STATES

ALABAMA

★**The Pilgrim Iron Ore Mines,** near Gaylesville in northeast Alabama, have resumed production at an initial rate of 60 tons of ore per day. Closed since the death of owner J. A. Pilgrim, the Pilgrim was re-opened by his son Hubert Pilgrim and T. J. Espy, who have formed a new corporation called the P. & E. Mining Co. P. & E. is shipping its ore to Republic Steel in Gadsden.

ALASKA

★**Development work, even in connection with critical metals, has slowed down** according to Commissioner of Mines, Leo Saarela. He lists several reasons for the slowdown: failure of the Government to resume a purchasing program for these metals; the labor shortage, which is increasing because miners drift to higher-paying construction jobs; and a shortage of repair parts for mining equipment. Saarela pointed out that the Red Mountain chrome property on Kenai Peninsula is ready to go into production, but awaits a buyer.

★**Operating news of the 1951 season:** A small group of men worked the Fern mine, the only lode property in the Willow Creek district. Crews diamond-drilled the copper deposits at Radovan property on Glacier Creek. Fairbanks Exploration Co. worked 5 dredges in the Fairbanks area, and 3 in the Nome area. Callahan Lead & Zinc Corp. operated its dredge at Livengood.

★**Alaska Copper Corp.** is pushing development of its hardrock copper holdings on Fidalgo Bay in southeastern Alaska, according to Charles F. Herbert. The property was worked from 1916 to 1921 by a previous company, but since that time has been idle except for development work.

★**U. S. Tin Corp. spent $400,000 this season** for exploration of its placer and lode tin properties on the Lost River north of Nome, according to president Harry Fishnaller. Also, crews under superintendent Paul Sorenson pushed toward fall completion of the new 137-ton mill. Though it is in the deep-freeze country, the U. S. Tin operation is only a few miles from ocean transportation, and some observers consider it the outstanding tin development in North America.

★**Brinker-Johnson Co.'s 4½-cu. ft. dredge** worked toward the head of Caribou Creek, and was expected to operate until about Nov. 1. The dredge started operations in 1941, was shut down in 1942 by L-208, and resumed operation in 1946. It is reported to have had such a good season that it paid off $250,000 in RFC loans and also a mortgage. This season, the company also prospect-drilled Butte Creek, 3 mi. away. George Hellerich is superintendent and Jack Marshall, dredgemaster.

★**David Burt introduced use of the parachute** for Alaskan prospecting this summer. He dropped into a point on the headwaters of Little Delta River, about 75 mi. south of Fairbanks, prepared a rough 350-ft. landing strip, and his partner, Vince Leier, brought the plane in the next day. After a four-day search for cobalt deposits, they flew back to Fairbanks.

ARIZONA

★**The Zonolite Co.** has established a processing plant at Glendale with C. L. Woodworth as manager. It will operate on a 24-hour basis and will process about five monthly carloads of vermiculite sent to Glendale from Libby, Mont., where it is mined, graded, and prepared for shipping. The new unit is one of 36 such Zonolite plants in the country.

★**As an aid to uranium mining** in the area, a $500,000 power plant will be built in Keams Canyon on the Hopi Reservation in northeastern Arizona. Bids for construction were scheduled to be opened on Nov. 21 at offices of the Bureau of Indian Affairs in Phoenix. Vanadium Corp. of America works a number of uranium mines on the adjoining Navajo reservation, and Indians are working others.

★**With some 100,000 tons of gold ore reportedly proven,** Oro Flame Mining Co. is developing for early production from the Oro Flame mine, 6 mi. south of Prescott. The present operators (Clyde W. Barrett is secretary and Charles C. Samuels general manager) report that numerous old workings along two veins which yielded $200,000 of gold in early days have been cleared and explored. They will build a mill as soon as machinery can be obtained.

CALIFORNIA

★**The Eldorado Copper mine,** in Placer County, sent a small shipment of copper ore to Garfield, Utah, for smelting. The property was investigated six years ago when the U. S. Bureau of Mines diamond-drilled eight holes totaling 1,613 ft., and found copper, silver and gold in massive sulphides in the Mariposa slate.

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California *(Continued)*

★**Natomas Co. is core-drilling placer deposits** near Carrville on the Trinity River. The drilling follows extensive testing done in 1950. Natomas holds an option on the property from Carrville Dredging Co., which bucketline-dredged it for several years.

★**J & W Mining Co.,** of Corvallis, Ore., is producing chromite from the old Tyson mine at French Hill in Del Norte County. J & W purchased the property in June of 1951, complete with a hydraulic giant for stripping broken serpentine, and is operating in the hydraulic pit (above the old mine workings). Crews diamond drill to prospect for lenses of chromite in the fractured serpentine, strip and mine the chromite, and truck it 75 mi. to the Grants Pass depot.

★**On the Yuba River near Marysville,** Yuba Consolidated is redredging areas which were previously worked by old methods. Yuba has also developed a large yardage of virgin ground by diverting the river from its main channel. The area is covered with dirt and gravel hydraulicked down by early place operators, and Yuba is digging it with 18-cu. ft. buckets to a depth of 124 ft.

★**Allan Kissock & Co.,** New York, has leased the tungsten deposit which George Hedrick and Leonard Shoush found early this year on the south slope of the Newberry-Ord Mountains. Scheelite ore occurs in a zone averaging 10 ft. wide which can be traced for several hundred feet. It is irregularly disseminated in a hornblende-rich zone in a complex composed mostly of quartzite and granitic gneiss; much of it appears to be associated with irregular quartz bodies. The company is driving an adit to intersect the ore zone about 100 ft. beneath the outcrop.

COLORADO

A road and a tunnel for lead and uranium

★**At Silverton, Bonita Mining & Developing Co., Inc.,** has just signed a 20-year contract with Winfield Morten, of Dallas, Texas, who will open and operate the Pride of Bonita and Minnehaha mines in the Eureka mining district. Morten plans to drive the Pride of Bonita tunnel through that property to the Royal Ark vein of the Pride of Bonita. Then he will continue it to the Ross Basin Mining Co. property and the Norman vein.

★**D. W. Schmitt,** Denver mining man, and **C. W. Kelly** of Hutchinson Kans., **have brought the Manchester group** of tungsten mines from Frederick W. Stroehle of Idaho Springs. The prop-

erty consists of seven ferberite claims in Gilpin County, which Mr. Stroehle estimates have produced between $200,000 and $300,000.

★**A. R. Rhine reports good progress** in sinking the General Teller shaft near Montezuma. O. W. Stevens, in charge of mining, states that plans are also proceeding for shipment of surface ore: Pipe is being laid to the area where ore is exposed; and when the pipe is complete, the ore will be mined by blasting and dozing. Trucks for shipment of the ore have been secured.

★**C. L. Davis and A. H. Wright** of Delta have leased 10 manganese lode claims in Gunnison County from Jacob G. Spehar of Grand Junction. They are building a mill on Spring Creek, remodeling cabins on the property, and improving roads to the mine and mill.

★**At Elkton, Acme Mining Co.** has opened the Carbonate Queen for mining, according to president W. A. Hayes of San Francisco. Southern Colorado Power Co. is now building a power line to the mine.

★**Beryl crystals and tantalum minerals** in commercial quantities have been indicated by work which Colorado Western Land Co. started last August. Those minerals, and also a showing of scheelite, are in pegmatites in the Long's Gulch placer claims, Turret mining district near Salida.

★**Sid Gately,** who is operating a lease at Mineral Park, has made four shipments to ASARCO. His ore has been running about 16 to 19% lead, 5% zinc, and 4 or 5 oz. of silver.

★**For Falk Metals Corp.,** a newly organized Denver firm, president Walter Falk signed an agreement to buy outright 6 barium lode claims, and to lease (with option) 3 more claims in northern Gunnison County. However, if the Government mill at Deming, N. M. judges the ore not valuable enough for profitable mining, the deal is off.

★**Glenville A. Collins,** at a weekly luncheon of Denver mining men, gave a resumé of his experience in the state dating from 1892. He and associates are now operating properties, in the famous Lake City district of Hinsdale County, which were owned by Mark Hanna in President McKinley's time. They have cleared several tunnels, bypassed cave-ins, and have struck a fine body of ore.

★**Congress has approved** the $4-million super-highway from Grand Junction to Dove Creek, right through the heart of the richest uranium fields in the U. S. The Bureau of Public Roads has approved the highway, and construction is expected to start soon.

★**Near Telluride, Idarado Mining Co.** has moved a big compressor in, and is breaking ground for a new tunnel

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WHEN EDISON Nickel-Iron-Alkaline Storage Batteries power your mine-haulage equipment, they help you cut costs in several ways. Their unequaled dependability gives the closest approach to failure-free, uninterrupted haulage it is possible to obtain. That's because their all-steel cell construction withstands rough usage; their alkaline electrolyte is a preservative of steel; their electrochemical principle of operation is free from self-destructive reactions.

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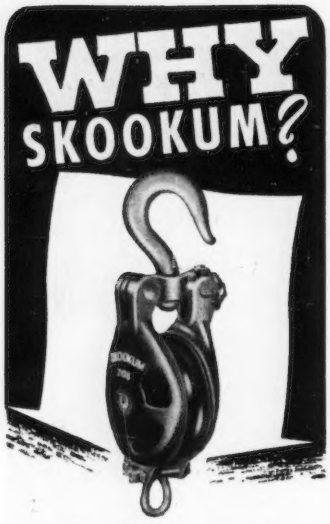

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Refer to pages F1-F4 in the 1950-51 McGraw-Hill Mining Catalog Service.

SKOOKUM CO. INC.

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Colorado *(Continued)*

500 ft. below the Meldrum. It will tap the Ajax vein, and a raise will be driven to the Meldrum level, according to Bill Nelson.

★**Joseph M. Bradley,** general manager of the Silver Ledge mine near Silverton, reports that an average of 50 daily tons of open-pit lead-zinc ore of good milling grade is being trucked to Shenandoah-Dives' custom plant at Silverton. A small crew drills, loads, and shoots the holes, and a power shovel loads the trucks.

★**Regarding the Leadville tunnel,** Paul T. Allsman, regional head of the U. S. Bureau of Mines' Mining Division, announced that the Bureau has postponed extension to the Tucson shaft and the Downtown lateral, which has been driven 250 ft. from the main bore. Instead, Allsman said, the Bureau proposes to run a lateral eastward from a point 135 ft. beyond the Robert Emmett shaft. For this, the Bureau has available about $300,000 of the recent $425,000 appropriation—enough to drive about 2000 ft.

★**Acid-grade fluorspar**—100,000 tons of it in the next five years—is the goal of Ozark-Mahoning Mining Co. at its newly acquired property at North Gate, Colo. Ozark optioned the property from Colorado Fluorspar Corp. in April, exercised the option in October, and is now developing the mine and a new mill for processing 200 to 250 tons of crude ore daily; operation of these new facilities is expected by July of 1952. Under M. P. Cloonan, who will manage the property, the company has already started to develop the vein and build the mill at North Gate; it has also provided housing for 24 families.

Under the terms of a DMPA-company agreement, DMPA will pay $60 per ton for all acid-grade concentrate that the company cannot sell to other U. S. purchasers. Ozark, in return, expects to spend about $1¼ million on the purchase and development.

IDAHO

Day prospects coppers—Hailey booms

★**Lucky Friday Silver-Lead Mining Co.** has driven the 2000-ft.-level crosscut to the vein, where it cut 4 ft. of high-grade and 4 ft. of milling-grade ore. The high grade assayed 82.6 oz. of silver, 57% lead, and 3% zinc. The company has increased daily production from 50 to 75 tons, and employs 20 men.

★**Dr. Earl Cook,** Professor of Mineralogy at the University of Idaho, recommends aerial photography for locating possible mineral deposits. He claims that the aerial method is much cheaper and three times faster than ground geology. The aerial geologist can frequently spot outcroppings that literally do not exist for the ground observer.

★**Coronado Copper,** the California company which entered the Coer d' Alene district only a few months ago, now owns large blocks of mineral territory both east and west of Mullan. On the east end, adjoining Hecla's Atlas-Rock Creek group on the north, the company is bulldozing the Moe group in preparation for an extensive diamond-drilling campaign. East of Mullan, the company has acquired a large block of ground, which also adjoins Hecla's Atlas group, on the south side of the Osborn fault. Several geologists and engineers, under S. K. Garrett, are directing the work.

★**Bunker Hill's** block-caving project is now producing 1600 to 1700 daily tons, according to J. B. Haffner, general manager. During a 20-day period in September, the operation produced 27,000 tons averaging 3.56 in combined lead-zinc, plus 0.82 oz. of silver. Only 50 men are employed on the project, so the overall tons-per-man-shift stands at about 32 or 34. The currently produced ore is typical of Bunker Hill's estimate that 5 million tons of caving ore will average 2.35% lead, 1.3% zinc, and somewhat less than an ounce of silver.

★**Mine superintendent Walter P. Deighton,** of the old Goldstone mine near Salmon, reports that while driving a lower tunnel to open the old Goldstone vein, miners intersected a new 3-ft. vein of gold ore. They still have an estimated 1000 ft. to go before they reach the old Goldstone vein.

★**Spokane-Idaho Mining Co.,** continuing its widened scope of activity, has agreed to operate Douglas Mining Co.'s Douglas mine for 10 years under a lease agreement. The Douglas, a short distance from Spokane-Idaho's Constitution mine, was the first mine on Pine Creek to pay a dividend; it was high-graded for zinc by Anaconda in World War I, and in World War II, the Small Leasing Co. built a modern mill, and operated the mine.

★**Hecla Mining Co.,** working on a $1-million, 4-company project (Hecla, Newmont, New Jersey Zinc, and Atlas), has nearly finished improving the Atlas tunnel at Mullan. The 18-in. track and 24-lb. rail have been replaced by 24-in. track and 30-lb. rail, and grade of the entire 12,000-ft. tunnel has been adjusted for optimum motor haulage. Sinking of the shaft from the 800 to the 2400 level will be started shortly, possibly on or before January 1.

★**At Hailey, Queens Mining Co.** will spend $133,830 (half loaned by DMA) for development of the Silver Star-Queens and for prospecting of the

adjoining Minnie Moore. Development will be through the Minnie Moore shaft, which has a new headframe and hoist. It will include a drift on the Silver Star vein from which early operators extracted a large tonnage of high-grade ore. The Minnie Moore was at one time Idaho's largest and richest silver-lead mine.

★**Also in the booming Hailey district,** Sun Valley Silver-Lead Mining Co. is sending dump ore through it new mill, and is re-opening the old Blue Kitten mine. Ross Roundy, the Wallace man who is president, general manager and founder of the company, reports that developments at the Blue Kitten are encouraging and surprizing.

★**Frank M. Rothrock,** vice-president of Day Mines, Inc., announces that 18 to 20 men have been working for several months to rehabilitate the old National lower tunnel in preparation for new and deeper development of the Missoula Copper property, 1000 ft. to the north, and the Copper King group, 3300 ft. northwest. Day now owns 160 continuous claims from the town of Burke to the Snowstorm mine northeast of Mullan. These are considered most important:

National, which has a wide bedded vein of very low-grade copper ore.

Missoula Copper, which has a showing of commercial copper ore that has been prospected only on the tunnel level.

Copper King, which has a 5000-ft. lower tunnel and a drift over a mile long on a vein with a continuous showing of sub-commercial lead-silver ore.

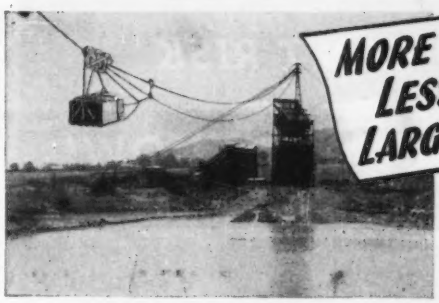
The development is a Day-financed project assisted by a $114,000 Government loan. Outside interest is focussed on the exploration for copper.

★**Federal Mining & Smelting Co.,** on the 3600 level of the Morning mine, has advanced a large prospect drift 225 ft. toward the Independence group, which Federal and Day have on a long-term lease. The Independence end lines are about 1000 ft. away.

★**Day Mines has 8 men reconditioning the Hunter shaft,** and will approach the Independence group from the east end of the American Commander claims.

★**Hecla Mining Co.,** agreeing to start development some time in 1952, has taken over the Banner-Idaho group on Boulder Creek south of Mullan. With the claims operated as part of the Atlas development, Banner-Idaho will get 35% of the net smelter returns from ore from its claims.

★**Hypotheek Mining Co.,** operating the Hypotheek near Kingston, reports discovery of a 14-ft. vein of milling-grade lead-silver-zinc ore on claims recently purchased from King of Pine Creek Mining Co. The ore is being stockpiled.



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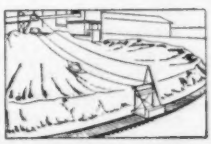
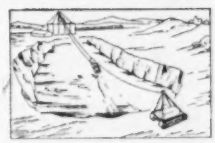


Sauerman Scraper Stockpiler



Sauerman Slackline Cableway

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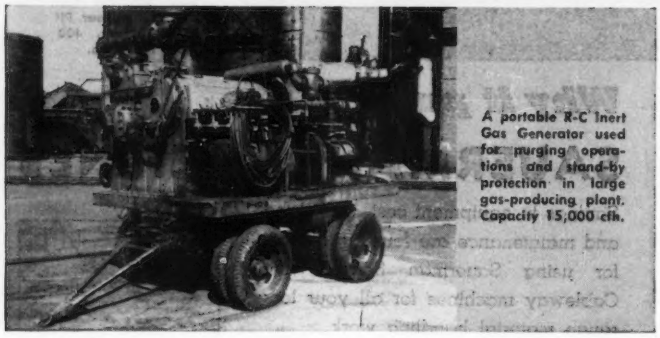

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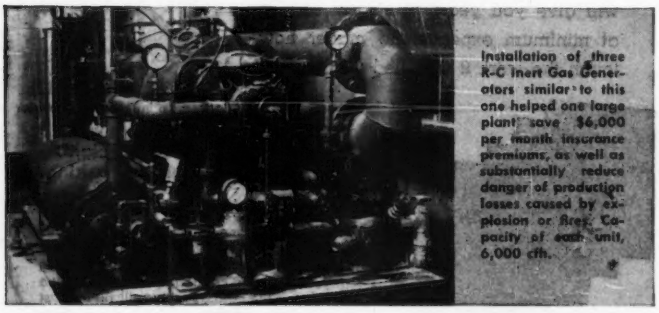


Installation of three R-C Inert Gas Generators similar to this one helped one large plant save $6,000 per month insurance premiums, as well as substantially reduce danger of production losses caused by explosion or fires. Capacity of each unit, 6,000 cfh.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

Idaho *(Continued)*

★**Operators of the old Livingston mine** in Custer County expect to net $25,000 monthly by milling dump ore produced in early days. They will run an estimated 60,000 tons from the dumps through their new mill, and will also sink the present 200-ft shaft an additional 500 ft.

★**On Pine Creek, Nabob Mining Co.** will spend $143,450 (half loaned by the Government). It will drive a 300-ft. crosscut to the western extension of the Nabob vein where diamond drilling showed 8 ft. of mineralization. It will also open the Nabob on the east side of the McDougal fault, and will connect lower with upper workings where leasers are producing a large tonnage of ore that Nabob is milling. Still another project will be opening of the Little Pittsburgh vein in Nabob ground, where a diamond-drill hole recently went through 9 ft. of sub-commercial vein material.

★**On Lake Gulch just west of Wallace,** Vulcan Silver-Lead Corp., jointly financed by ASARCO and Day Mines, has completed installation of its hoist and surface plant. With final conditioning of the shaft also complete, the company is preparing to resume exploration on the 3,000 level.

GEORGIA

★**Special Master John J. Gilbert** heard final arguments Oct. 31 in the suit of Georgia Kaolin Co. of Dry Branch, Ga., against the Thiele Kaolin Co., of Sandersonville, Ga., filed in September, 1949 alleging infringement of a patent issued in 1939 to William T. Maloney. The patent covers a process for treating Georgia clay to improve its qualities and make it suitable for use in a coating process on high-grade paper for books and magazines. Decision is not expected for several weeks.

LOUISIANA

★**At Chalmette, Kaiser Aluminum & Chemical Corp.** recently produced the first batch of aluminum several months before completion of the entire plant. The first potline—144 pots housed in two 960-ft.-long buildings—are now being insulated with alumina and other material. The second potline is scheduled for early 1952, and the third potline for a little later in March. By mid-1952, all 4 potlines will be in production. Power for potlines 1 and 2 is ready to go—80 Nordberg gas-diesel-powered dc generators rated at 1,290 kw each. Power for potlines 3 and 4 will be completed early in the spring and will be furnished by 5 steam turbo-generators. Annual production will be 200 million lb.

MARYLAND

★**At Baltimore, Mrs. Charles M. White christened** the second of Republic Steel Corp.'s three ocean-going ships which are being converted to Great Lakes iron-ore carriers. She splashed champagne on the bow and christened it the Charles M. White in honor of her husband, Republic's president. Like the Tom M. Girdler, the Charles M. White will be towed to Chicago via the Mississippi River and will be further outfitted there.

MICHIGAN

★**Mather "B" mine at Negaunee,** operated by Cleveland-Cliffs Iron Co., is testing a conveyor-belt system for stockpiling ore this winter. The belt is 655-ft. long, 36-in. wide, and travels 400 fpm. The belt gallery is of fireproof construction enclosed in double corrugated steel housing with 2 in. of insulation between the steel members. A self-propelled belt tripper discharges the belt at various unloading chutes spaced 12 ft. apart along the gallery.

★**With new and increased activity on the Michigan iron ranges,** such as Inland Steel Co.'s opening of the Cayia mine and Verona Mining Co.'s opening of the Lawrence mine, employment in August, 1951 was up 15% from August, 1950.

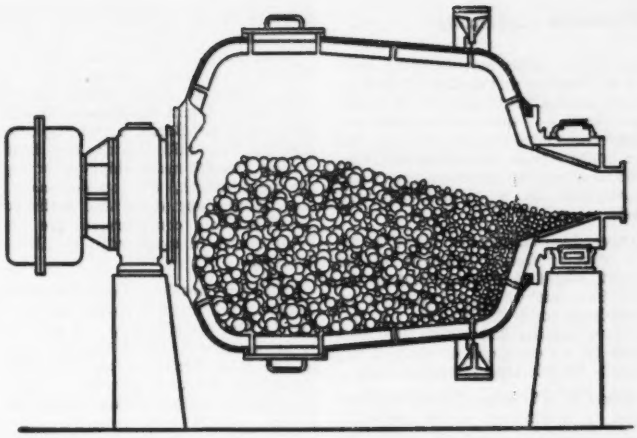
★**D. C. Slusher got the key lease** in a recent sale-and-lease conducted by the State of Michigan. His lease permits prospecting for three years on 1,531 acres in Township 29 of Alpena County. He is required to spend at least $10 per acre per year, and at the end of three years must start mining, pay lieu royalties, or drop the lease.

★**At Mason, on Torch Lake,** Quincy Mining Co. is preparing to treat tailings or amygdaloid sands which have built up at No. 2 mill over the last 20 years. The company will install a Bucyrus-Erie pump at the sands, will lay approximately 5000 ft. of 20-in. pipe to the shore plant, and will install a 1000-kw Fairbanks-Morse diesel generator at the sand dump to furnish power for pumping the sand.

★**Though Don C. Weeks,** director of the Michigan Department of Economic Employment, was recently quoted as saying that Calumet & Hecla might shortly announce plans for developing a wholly new copper area, O. A. Rockwell, Calumet's general manager, said the company has nothing new under way so far as developing a new copper area is concerned.

MINNESOTA

★**M. A. Hanna is operating** 20 shifts per week at the new Carlz mine near



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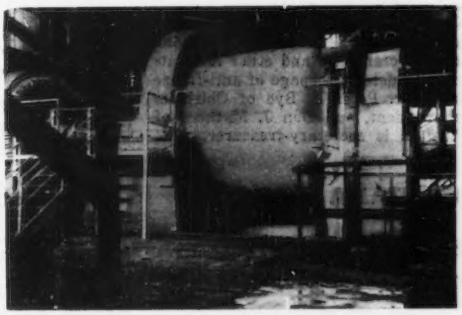
1. **The tapered barrel causes correct ball alignment. Grinding energy is conserved thereby. Ball consumption is reduced, the big fellows are kept away from the little ones.**
2. **The Tricone Mill occupies less floor space for a given grinding volume than any other type of mill ever built.**
3. **New design bearings, reduce friction and cut overall power consumption about 5%.**
4. **When crowded for more capacity, a grate is added, at a proportionate increase in power, but with this type of grate mill, the large balls are kept at the feed end, and only smaller balls are in contact with the grate, which minimizes wear.**
5. **Tapered ends reduce end friction, as is evidenced by lower liner consumption and power.**
6. **Ideal for large tonnages.**



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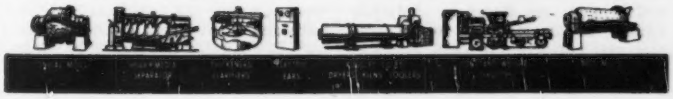

Minnesota *(Continued)*

Nashwauk. Crews are stripping with a 9-W dragline and a new 151-M 6½-cu.-yd. shovel. Eight new 34-ton trucks have been put into service, and garages and shops are now complete. At the South Agnew mine near Hibbing, Hanna is mining direct-shipping and wash ores on a 20-shift-per-week basis.

★**Oliver Iron Mining Co. set off a record blast** on Oct. 20 when it blasted a rock island in the east end of the Hull-Rust pit to recover a layer of underlying ore: 238,541 lbs. of explosives costing $38,423.25; 108 drill holes for a total depth of nearly 2 mi. Result: 287,000 tons of broken rock.

★**Roger V. Whiteside,** Duluth business man, is continuing to diamond-drill the nickel-copper discovery in the Duluth gabbro at a point 12 mi. southeast of Ely.

★**All-rail movement of ore is on the uptrend.** Guesses for the 1951 total are that 5 million tons will go from the Lake Superior region by all-rail movement. Cars used are standard gondolas used for coal or stone, and because of the high density of iron ore, they are loaded about one-third full. Keeping up with the trend, U. S. Steel's subsidiary, the Bessemer and Lake Erie Railroad has ordered 500 new cars specifically designed for iron-ore haulage.

★**To find defects in diesel equipment,** Northern Testing Laboratory, Inc. has set up a new service on the Mesabi. It tests crankcase and other lubricating oils, detects seepage of anti-freeze or water. Peter E. Bye of Chisholm is president, and Don J. Mathers of Virginia is secretary-treasurer.

MONTANA

Brown's Lake reported ready for development

★**Trout Mining Division** of the American Machine & Metals, Inc. will shortly put into operation its nearly completed lead-zinc-silver flotation plant at Philipsburg, according to L. B. Manning, manager. The company also continues to operate magnetic plant producing high-grade chemical manganese dioxide concentrates. J. C. VanderPyl, president, and C. W. Anderson, vice president, both of New York City, inspected the Philipsburg operations in October.

★**Metals Milling Co.,** of Tacoma, Wash., has completed its custom flotation plant at Basin in Jefferson County, and is ready to receive custom ore, according to John MacGinniss, general manager and chief engineer. The plant has a capacity of 100 tons per day and expects to treat the lead-zinc-silver ores from the Basin-Boulder and other districts of Montana. Dr. Albert Turk, Diamondville, Wyo., is metallurgist; Frank Soll, Basin, is mill superintendent and Harold Lorenz, Basin, is building consultant. The mill, which has been testing ores for many shippers during the past month, will employ seven men. Mining operators, who desire to have their ore concentrated, are advised to get in touch with Mr. MacGinniss.

★**Williams Phosphate Corp.** has commenced work at its property near Alder in Madison County, and expects to drift 1,000 ft. on the hanging wall of the vein, according to Griff Williams, president. A primary crusher and ore bin are being installed at the mine.

★**Double Eagle Tungsten Co.** has been awarded a government exploration and development loan to open its tungsten property ½ mi. east of the old town of Black Pine in Granite County. William R. McLure, president of the new company, states that an incline shaft will be sunk, and that plans are being developed to construct a mill to produce high-grade hubnerite concentrates.

★**Western Montana Exploration & Development Co.** will take over the properties formerly owned by Key & Durand 10½ mi. southeast of Hall in Granite County. The new company has also been assigned the government exploration and development loan awarded to Key & Durand. The U. S. Bureau of Mines in 1945 and 1946 performed a substantial amount of diamond drilling and other work on the property and is said to have developed about 200,000 tons of zinc-lead-copper ore in what is known as the Shamrock orebody. Further development work will be done under the direction of O. J. Durand, Hall, Mont.; and Francis A. Hancock, Missoula mining engineer. Dr. Roy W. Key of Missoula, president of the new company, is also president of the Western Montana Mine Owners & Prospectors Association.

★**At Silver Bow,** 10 mi. west of Butte, Victor Chemical Works has put into operation part of the first unit of its $10-million plant to produce elemental phosphorus. Construction of the plant was started in August, 1950, and it is expected that building operations will be complete sometime in 1952. The main office of the company is in Chicago.

★**A large tungsten mill** will reportedly be built in Beaverhead County, south of Butte, to concentrate the low-grade tungsten ores from Brown's Lake and Birch Creek districts. Minerals Engineering Co., headed by Blair Burwell, Grand Junction, Colo., has substantial interests (see November

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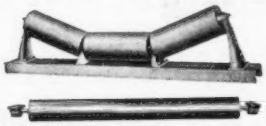

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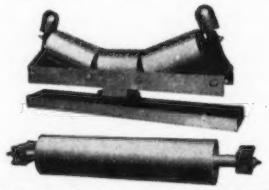

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Highlights). And American Alloy Metals, Inc., headed by Frank Eichelberger, Spokane, succeeding Brown Lake Tungsten Co., has taken over a large acreage in the Brown's Lake district.

NEVADA

Interest centers on iron and tungsten

★**Lakeview Tungsten Corp. is building** a 50-ton mill on its property in Humboldt Canyon, Pershing County, to treat 1000 tons of scheelite ore in dumps at the property. F. H. Strickland, manager of Lakeview, and his associates moved the mill from California, where the firm formerly operated under the name of Tulare County Tungsten Mine.

★**Open-pit iron-ore mining** is also (see item on Simplot) under way near Coaldale Junction in Esmeralda County on a property owned by C. C. Boak, Nye County mining man. A syndicate has leased the property for 5 years and plans to ship 40,000 tons of iron ore, mostly to Japan. Wells Cargo, Inc., of Reno, has a contract to haul the ore to Mina for shipment. With two shifts daily, the operators expect soon to produce 500 daily tons of ore.

★**Using a diesel-powered drag bucket and bulldozer,** Gus Becker and one helper are recovering free gold at Dayton—on the Comstock Lode near the mouth of Gold Canyon where the discovery of gold led to discovery of the Comstock itself. Becker, a Carson City man, feeds the gravel to a diesel-powered trommel which handles about 500 tons daily. He says there is enough gravel to last him for years.

★**In Elko County, Jack Mink reports** assays running as high as 5.8% tungsten on his properties in the Jarbridge district. In an adit 350-ft. long, and a shaft 65-ft. deep, he reports extensive showings of ore.

★**Robert Rysch and Steven Corwin** have started to develop their scheelite lease in the Sierra foothills 2 mi. south of Carson City. (Fred Forbush and Dave Moose of the Stewart Indian School faculty discovered the property.) Rysch and Corwin have moved a compressor in, are drifting on the 35-ft. level, and have already hoisted some ore. Scheelite shows in many places on walls of the shallow shaft.

★**Dow Metals, Inc. has taken over** the old mill at Kinkead, 12 mi. west of Luning, and has converted it into a tungsten pilot mill. Dow is bringing in ore from a deposit which adjoins the old Copper Queen mine in Mineral County.

★**In Virgin Valley, Howe Enterprises** is developing a tungsten-mica-lead

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Nevada *(Continued)*

property. Development is under the direction of Bert King, general foreman, who, with 35 men now on the payroll, says he expects to increase that number soon.

★**Percy Dobson,** superintendent of the Summit King mine near Fallon, came to Tonopah recently to lay the groundwork for construction of a surface plant at the old King of Tonopah shaft. Present plans call for repair of the old shaft which was sunk to a depth of 900 ft. some years ago.

★**On the Comstock, three mills have been converted from gold to tungsten: Dayton Consolidated Mining Co.** at Silver City has revamped its cyanide-flotation mill, installed modern machinery and several tables in order to handle tungsten ore from the Jumbo district.

Zeb Kendall's Consolidated Virginia mill in Six Mile Canyon is now concentrating ore from the M.G.L. mine near Pyramid Lake.

Joe Riley has converted the Terwilliger mill at Silver City, and will concentrate ore from his claims in upper Brunswick Canyon.

★**E. L. Cleveland and P. J. Burfening** are associated in a tungsten operation at the southeast end of big Washoe Lake in Washoe County, where they have reportedly exposed promising ore.

★**Golden Horseshoe mine,** in the Wild Horse Canyon of Pershing County, will probably run its mill all winter. In the last few weeks, machinery has been put under cover, and a new crusher has been installed. H. F. Larson, Reno, manager of the property, says that principal attention will be given to milling 18,000 tons of dump ore which carries good values in gold.

NEW MEXICO

Sante Fe forms uranium mining company

★**International Minerals & Chemical Corp.** recently completed the first pre-grouted shaft in the Carlsbad basin, and reports not a trace of water. Groundwater has been the main handicap in sinking shafts in the potash basin, and company officials are pleased with the success of pre-grouting in this No. 4 shaft. Railroad spurs are now being laid at the plant site.

★**George Koepke and H. B. Jones** of Winston report that they recently struck silver-lead ore with some copper at the Pelican group near Hermosa.

★**DPA has granted a** 5-year writeoff of 80% of $1,498,000 which Phillips Chemical Co. will spend for a sulphur plant to be built near Eunice, adjacent to its present gasoline plant.

★**Near Mora, Great Western Mining Co.** plans to expand its mining and grinding of scrap mica. New methods of making electrical insulation from scrap mica have pepped up the market.

★**Strike violence** at Empire Zinc Co. resulted in formation of a law-and-order committee by Silver City businessmen in September. Now, CIO United Steelworkers have reportedly sent representatives in to Grant County.

★**To exploit uranium on its lands,** Santa Fe Railway Co. formed a wholly owned subsidiary, Haystack Mountain Development Co. Anaconda Copper Mining Co. has requested AEC permission to build a mill in the Bluewater area to process the ore. Anaconda is also exploring a new uranium find on the Laguna Indian reservation, 50 mi. west of Albuquerque, and has filed for corporate permission to operate in New Mexico.

NORTH CAROLINA

★**Great Western Mining Corp.** recently opened two mines in the North Cove section of McDowell County. Near Pitts Station, 12 mi. north of Marion, the company is working an estimated 360,000-ton manganese deposit. Three miles from the manganese mine, they are working a copper deposit described by company officials as "a large true vein of high purity." Great Western, chartered only four months ago, is headed by T. C. Letellier of North Cove, and Mr. and Mrs. George Sutton of Hendersonville.

OREGON

★**Resentful protests, freely expressed,** were the keynote of an Oct. 15 meeting where the Oregon Mining Association discussed GSA's modification of the chrome purchase plan. Five men stated they had started construction of mills; two of them said they could not continue construction on the basis of the new order.

The new order: GSA will end the program whenever 200,000 tons have been purchased or by June 30, 1955.

The original order: The plan was to extend for five years, but might be terminated after two years with one year's notice. The only quantity restriction was that each producer was limited to 2000 tons during the first year.

★**Donald A. Foster plans soon to open-pit** a body of chromite ore at the Black King mine in Josephine County.

★**For tungsten hunters:** Oregon State Department of Geology & Mineral Industries has issued a preliminary report on tungsten occurrences in the state. Included are a number of depos-

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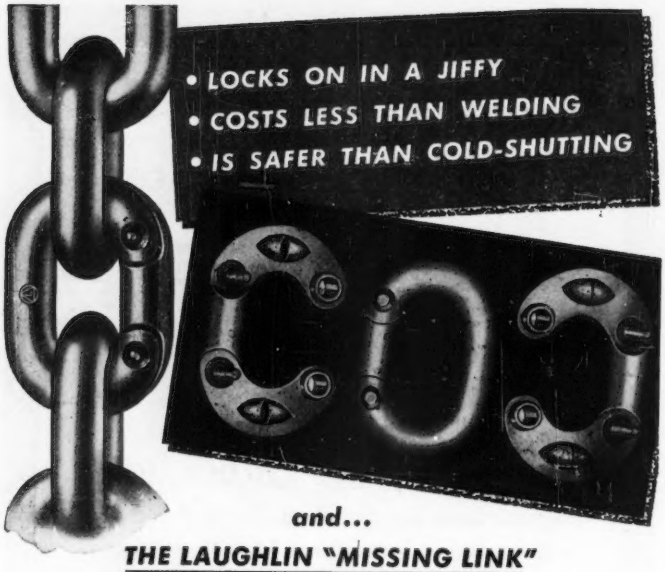

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Oregon *(Continued)*

its which the Department feels are possibly worth prospecting.

★**Northwest Gypsum Co.'s new tram** will carry gypsum from the Rock Creek mine near Weiser to a railroad siding on the Oregon side of the Snake River. According to Fred Still, manager of the company, the tram **will cut haulage costs from $1 to $0.15 per ton.**

★**Lawrence N. Roba** of Canyon City planned to fire up his new cinnabar retort on Deep Creek, and to be in production before you read this.

UTAH

★**The old Murray smelter,** formerly owned by ASARCO and once the largest smelter in the Salt Lake Valley, is nearing its end. Murray American Mill Co., which purchased it from ASARCO, had sold most of the equipment in the last two years, and recently sold the 117-acre tract of land for "industrial plant sites and retail development." Remaining, however, are the two stacks, one 455 ft. high and another about 50 ft. shorter, which the new purchasers are thinking of using as grain elevators.

★**In Tooele County,** Star Dust Mines, Inc. will put up 25% of a DMA contract for $15,240 to explore its tungsten property.

★**A wildcat walkout** by 290 miners at U. S. Smelting, Refining, & Mining Co. brought a three-day halt in production, but ended on Oct. 31. The trouble: Miners working on a contract basis (optional) were at times making more than salaried men. Most had been persuaded to slow down, but one unnamed miner had apparently refused. So CIO United Steelworkers walked out.

WASHINGTON

A big mining expansion is under way

★**American Smelting & Refining Co.'s** Van Stone operation, 25 mi. northeast of Colville, is making steady progress toward production sometime in the fall of 1952. Western-Knapp Engineering Co. is in charge of construction of the 1000-ton concentrator. Isbell Construction Co., supervised by ASARCO engineers, will open-pit the lead-zinc deposit.

★**Chewelah Copper Co.,** organized by a group of Yakima business men, is developing the old United Copper mine, 4 mi. northeast of Chewelah. Alfred E. Kaiser, a Yakima mining engineer, is directing operations, has eight men on the job, and has opened

up 100 ft. of the old tunnel. Assays from the dump and tailings are said to show encouraging values in copper and silver.

★**Plutonium costs are falling**—in spite of higher cost of materials, and sharp wage increases—according to David F. Shaw, manager of the Hanford plant: "The cost of production is less than half per chunk what it was in 1946 and 1947. We squeeze more out of the stuff we've got, and we get much more output per person." Note: Since plutonium does not deteriorate, stockpiled supplies of A-bombs could be used later as a source of power. (The half-life of $_{94}Pu^{239}$ is 24,000 years, and it decays into $_{92}U^{235}$.)

★**At the Mullen mine** east of Chewelah, miners have sunk an inclined winze for 30 ft. and followed ore all the way, according to E. J. Mullen, owner of the mine. The vein is about 5.5 ft. wide with a high-grade streak varying from 1.5 to 2 ft. Mullen plans to intersect the vein at 250 ft. of depth by re-opening the Windfall tunnel and driving it into the Mullen property. At last report, he had 150 tons of lead-gold-silver-zinc ore in stockpile awaiting shipment to Trail.

★**From the Mohawk mine** 3 mi. northwest of Conconcully, Sunny Peak Mining Co. is producing 60-oz. silver ore from a vein 3 to 10 ft. wide in the footwall of a wide shear zone, according to C. L. Butler who is in charge of work. Sunny Peak has recently built a 750-ft. track tram from the road to the No. 2 tunnel, and a dry room and compressor house.

★**Germania Consolidated Mines, Inc.** plans to expand its tungsten operation 80 mi. northeast of Spokane. Since production was resumed last June, Germania has shipped approximately 7,000 lb. of jig concentrates (over 70% wolframite) to Spokane, from where they go to Kennametal, Inc. at Latrobe, Pa. The company is now planning a 50-ton mill designed to remove iron and sulphide and save molybdenum minerals.

★**Just south of Wenatchee,** at the Gold King mine, contractors for Anaconda Copper Mining Co. have completed two exploratory shafts, are sinking a third shaft (inclined) and are driving horizontal exploration workings. Anaconda holds an option to buy this siliceous-gold property from Lovitt Mining Co.

★**John Russell and George M. Gibson,** who hold a lease and option on the Red Shirt mine 3 mi. southeast of Twisp, are planning a 25-ton cyanide mill at the property. They reported that they have blocked out 30,000 tons of gold-silver ore, and recently purchased machinery for the plant.

★**Pioneer Mining Co.,** which started work at its Longshot mine northeast of Colville in May, started trucking 60 to 70 daily tons of silver-lead-zinc ore to the Young America concentrator at Bossburg in October. A test

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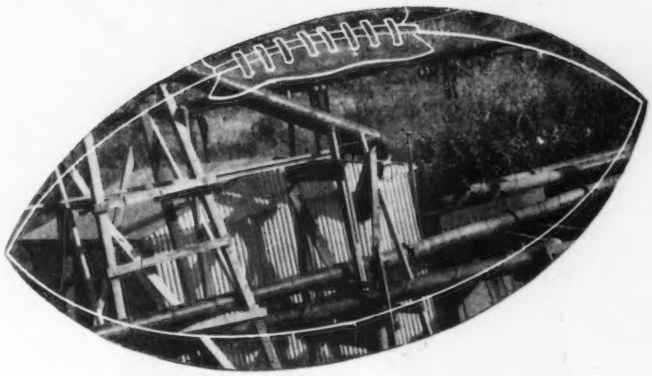

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Washington *(Continued)*

shipment of crude ore sent to Trail in July averaged 54.7 oz. of silver, 9% lead, 10% zinc, and 0.03 oz. of gold. Pioneer is open-cutting the deposit over a width of 35 ft. and a strike length of 150 ft., and plans to diamond drill in the hope of proving enough ore for a 100- or 150-ton mill.

★**Sullivan Mining Co.** recently stockpiled 3,500 tons of zinc-lead ore during development work on Metaline Contact ground. On Oct. 8, the company started trucking 200 daily tons to the Josephine mill of Pend Oreille Mines & Metals Co., according to R. W. Neyman, general superintendent. The mine will be developed further, Mr. Neyman reported, before mining operations are started.

WISCONSIN

★**This year, Wisconsin Institute of Technology, at Platteville,** has instituted a fourth year of training for engineering students. The 1952 senior class of '39 will be the first to get Bachelor's degrees in one of two engineering electives: Mining or Civil.

★**At Dodgeville,** with DMA approval of six contracts for exploration by churn drilling, Dodgeville Mining Co. has accepted two contracts, and has started drilling on the Weigle property west of Linden and the Jones property south of Dodgeville; to date the drills have not struck ore but have cut mineralization in most of the holes at the Weigle. The pending contracts are for the Jenkins, Thomas, Powell, and Parsons leases near Dodgeville.

WYOMING

★**Developing the uranium discovery** on the plains near Lusk, a group of Denver, Colo. men formed the Wyoming Uranium Corp. In the past few months, they have opened up the property, and recently shipped five cars of uranium ore to Vitro Chemical Co.'s plant at Salt Lake City. One high-grade car of ore was enroute in late October. The ore occurs principally as uranophane (a green or yellow calcium-uranium silicate), and runs about 0.25 to 0.30% U_3O_8. Charles O. Parker, president, is trying to get AEC to diamond-drill the deposit.

★**Harry Ferguson and Pat Dinneen** of Cheyenne have completed cleaning out the timbers, debris, and water from the 55-ft. level to the 140-ft. level of the old Copper King shaft, Silver Crown mining area, 22 mi. west of Cheyenne. Dinneen reports that the mine was filed on in the early 1870's and developed to a depth of 160 ft. Miners had worked it in rooms and chambers from 20 to 40 ft. wide, but

abandoned it about 1900. The orebody is 300 ft. wide and 2600 ft. long, with malachite down to 100 ft., sulphides and native copper below. Primarily a copper mine, it also carries values in gold and silver.

IN CANADA

★**At least 35% of Canada's 1952 gold production** will probably be sold on the public industrial market. That would mean sales of about 1.5 million oz. Though a clear price has not yet been established, a premium of $2 or more per oz. above the $35 (U.S.) price seems reasonably assured. This new development ensues from action of The International Monetary Fund to permit gold-producing countries to sell on the open market. Canadian gold producers welcome the move, and the Canadian government has assured the producer of his rights to sell on the open market.

★**The catch** is that the government will pay no cost-aid to any producer who sells on the open market. That means that only those low-cost producers, or base-metal mines which produce gold as a by-product and were not eligible for subsidy, will take advantage of the offer. Maximum federal subsidy for a mine in 1951 is $11 per oz., which, when added to the official $37 per oz., gives a maximum cost-aid price of about $48 (Canadian) per oz. Only a few straight gold mines have so far decided to abandon the security of this cost-aid: Kerr-Addison, which has received no cost-aid; Lake Shore and San Antonio, which received only token payments.

BRITISH COLUMBIA

★**About 50,000 tons** of British Columbia iron ore were shipped to Japanese mills from August to November from Quinsam ore deposits on Vancouver Island by the Argonaut Co., subsidiary of Utah Construction Co., San Francisco. The reverse flow has started from Japan in the form of finished steel to ease defense-created shortages.

Meanwhile, Argonaut is also working with Texada Mines Ltd. in developing iron ore deposits on Texada Island off Vancouver Island's east coast. By the year-end Quinsam shipments are due to reach 80,000 tons monthly, and Texada ore is expected to bring this total to 120,000 tons.

★**Emerald Tungsten mine** in the Salmo area, acquired by the Canadian government from Canadian Exploration Ltd., will be in production before year's end. Canadian Exploration is building a 250-ton mill and bringing the property into production for the government. The company has also developed tungsten ore on its own property near the government area. Sufficient ore has been estimated to supply contracts made until mid-1958.

★**Western Uranium Cobalt Mines Ltd.'s** 200-ton daily Red Rose mill at its Rocher de Boule property has gone into operation, following completion of a 1,600 hp. hydro plant. Preliminary estimates are that the mill will produce 11,000 units of tungsten in November and about 19,000 units in December.

★**Sil-Van Consolidated Mining & Milling Co. Ltd.** plans a 150-ton-per-day flotation mill. Orders have been placed for a classifier, flotation cells, filter and other equipment. Gold-silver-lead-zinc ore sufficient to yield an estimated operating profit of $3.8 million has been indicated in the Canary-Hummingbird vein system at this Hudson Bay Mountain property near Smithers.

★**Jackson Basin Mines Ltd.**, formed to operate properties near Retallack in the Slocan, plans to build a mill early in 1952. Zinc will be the main product, with some silver, lead, and cadmium.

★**Hamil Silver Lead Mines Ltd.** expects to have its 150-ton mill in operation at its Argenta property by the end of March. The mill has been dismantled at the Velvet property at Rossland and is being moved to a 27-acre site, 1.5 mi. from the mine. Output of the diesel-powered operation can be stepped up to 500 tons when known orebodies are extended and developed. More than 100,000 tons of silver ore with 11% combined lead-zinc are indicated in underground workings.

★**Bralorne Mines Ltd.** reports that the long crosscut on the 26th level from the Empire shaft has been completed and will improve ventilation at lower levels.

★**Chillicopper Corp. Ltd.** of Toronto, has obtained control of Rico Copper Mines Ltd., and will drive a 4,000-ft tunnel costing $500,000. Between Chilliwack and Hope, up the Fraser Valley from Vancouver, the tunnel will go under the main orebody. It replaces a previously considered tram-line method which could not have been operated year-round because of snow.

★**Western Mines Ltd.**, formed by leading Vancouver mining engineers and headed by Harold Wright, metallurgist, has taken over the mill and mine of Ainsmore Consolidated Mines on Kootenay Lake. Western plans maximum production from the 100-ton mill on the lead-zinc property, with an expanded program exploration and development.

★**British Columbia Metal Mines Ltd.**, a new corporation, is developing the Bismark property in Ainsworth mining division. The group comprises eight claims adjoining the Cork Province mine near Kaslo. A contract has been awarded to Columbia Diamond Drilling Co. to explore ore at depth. Ore at the 6,350-ft. level is estimated

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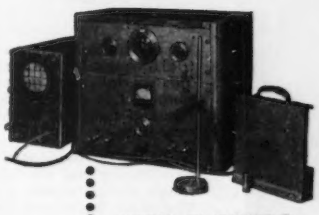

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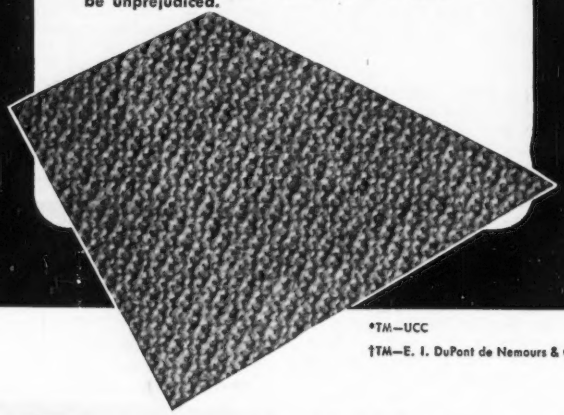

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British Columbia *(Continued)*

at 40.3% zinc, with low values in lead and silver.

★**At the Danzig base-metal property** near Nootka on Vancouver Island, indicated ore has been increased from 7,000 tons to between 25,000 and 30,000 tons, according to a report from Spud Valley Gold Mines which holds a 60% interest in the property. Ore averages 12 to 14% zinc over an average width of 4.2 ft. Spud Valley is under management of Transcontinental Resources Ltd.

★**Slocan Base Metals Ltd.** has completed an exploration program of 6,200 ft. of bulldozing and considerable diamond drilling on its silver-lead-zinc property near Sandon, and plans an early start on tunneling. Extension of the Queen Bess lode has been traced for 1,500 ft. and varies in thickness from 1 to 5 ft. of oxidized quartz.

★**Silver Ridge Mining Co.,** organized and promoted by Harry P. Pearson, of Wallace, Idaho, and which took over the old Wonderful lead-zinc mine at Sandon, B. C., is now shipping high-grade ore to the Trail smelter and lower-grade ore to the old Kootenay Belle mill at Whitewater, B. C. The company recently held a stockholders meeting and elected W. P. Bost, president; F. C. Robinson, secretary-treasurer and J. R. Kenney, managing director. Other directors include R. C. Moffitt, J. B. Haffner, R. K. Kenna and Harry P. Pearson.

★**Estella Mines Ltd.,** at Wasa near Kimberley, has put its new 150-ton mill into operation. Mill feed is expected to contain a minimum of 20% combined lead-zinc. Drivers truck ore 17 mi. from mine to mill.

★**Kootenay Base Metals** expects to start milling at its Fort Steele base-metals property early next year. The main concentrator building is almost finished and a new bunkhouse is well under way. The mining property, 7 mi. away, was known previously as the Kootenay King. It consists of 34 claims, of which 28 are in solid rock. Ore reserves blocked out by a previous operator are estimated at 16,680 tons.

MANITOBA

★**San Antonio Gold Mines Ltd.** reports it will sell its gold on the free market as soon as arrangements are completed. Payments under the Emergency Gold Mines Assistance Act netted the company 30¢ an ounce in 1950, and for the first nine months of 1951 80¢ an ounce.

★**Callinan Flin Flon Mines** has commenced diamond drilling on the Dan claim, northwest of the Hudson Bay smelter. Re-examination of cores from former drilling on this claim showed a 25-ft. length carrying 2% copper.

The new program calls for 10,000 ft. of drilling.

★**Hudson Bay Mining & Smelting** reports zinc production at a new high. Refined zinc output has reached 300 tons per day. The zinc fuming plant is running at half capacity handling slag from current operations. Mine tonnage remains at 5,000 a day but will be reduced to 4,000 when the zinc fuming plant is completely brought in. The Co. is storing its gold production (about 130,000 oz. yearly) for sale on premium markets.

ONTARIO

One mine shipped ore that ran 1% silver

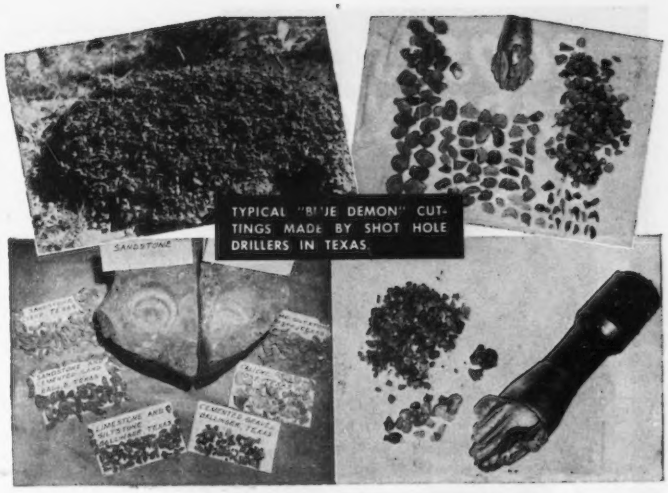
★**Harrison-Hibbert Mines,** newcomer in the Cobalt camp, is now in production, shipping 50 tons of ore daily to the nearby United Cobalt mill. High-grade hand-cobbed ore is also being shipped; the first shipment consisted of 10 tons that averaged 3,000 oz. silver per ton.

★**New ore developments at depth** are brightening the outlook for Lake Shore Mines, biggest gold producer in Kirkland Lake, and its subsidiary Kirkland Hudson Bay Mines, with property adjoining to the south and east. The new ore is being found south of the main break between the 7,300 and 7,800-ft. levels in the first work done following completion of shaft-deepening. While a great deal of work remains to be done before the full significance of the new showings can be determined, it looks as though the whole future of both properties could be affected in a major way.

★**The Cobalt camp,** which to this time has been strictly a silver-cobalt area, is to have its first base metal producer. Penn-Cobalt Silver Mines is making plans for a 250-ton mill on its Foster property. Drifting and extensive underground drilling have outlined 300,000 tons averaging 3% zinc, 1.5% lead, 0.5% copper, and 0.75 oz. silver per ton. First step in the project will be the sinking of a new three-compartment shaft to 575 ft.

★**Although delays in delivery** of materials have delayed plant additions somewhat, Falconbridge Nickel Mines expects to meet its production objectives on schedule during the next two years. These call for output of 26.5 million lb. of nickel this year; 28.5 million lb. in 1952; and 30 million lb. in 1953. By 1953, also, copper output will have increased to 15 million lb., and a substantial amount of cobalt will also be marketable.

When the current expansion program is completed, Falconbridge will have three producing mines: The original (and still much the most important) mine from which the company takes its name will be aided in pro-



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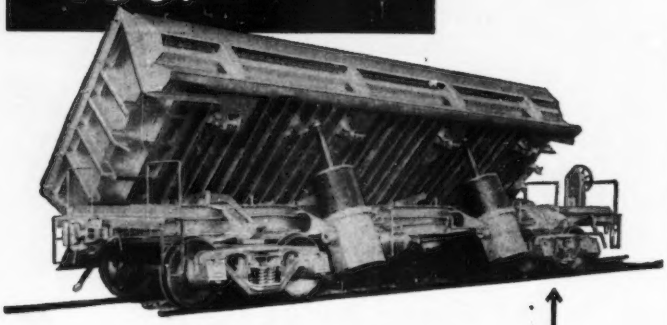

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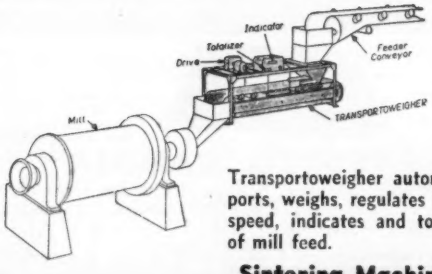

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Ontario *(Continued)*

duction by the McKim, brought into operation last year; and the Levack, on which a big production shaft is now being sunk to 1,100 ft.

★**Jardun Mines** has been formed to develop a promising lead-zinc-silver show in Jarvis and Duncan twps., a short distance north of Sault Ste. Marie. The occurrence, an old one, was first investigated in 1875, but has lain dormant for many years. The new company is financed and controlled by Transcontinental Resources Ltd. Limited underground work on the four known zones has indicated a quarter of a million tons averaging 5.9% combined lead-zinc and 1.05 oz. silver across 22.4 ft., with large additional tonnages suggested. A new three-compartment vertical shaft will be put down early in 1952.

QUEBEC

Several copper mines are being revived

★**Production sights on zinc** are being raised by Barvue Mines, scheduled to start mining from its big low-grade orebody in Barraute Twp. next year. Plans have already been made to up the initial milling rate from 5,000 to 6,000 tons, and it is now probable that original plans to produce 1,000 tons of pyrite daily will be changed in favor of greater stress on zinc. If this change materializes, output of zinc concentrates would be raised from 200 to 250 tons daily.

★**Louvicourt Goldfields Corp.** is diamond-drilling on its recently acquired property near Acton Vale in the Eastern Townships. The drilling is designed to probe the vicinity of an old open cut from which some copper was produced many years ago. The property is on the same range of hills as the property of Quebec Copper Corp., and was first worked in the days of the American Civil War. Recorded output was 16,300 tons averaging 12% copper.

★**Another copper producer** is scheduled to commence operations in 1953, finances for the purpose having been raised by Opemiska Copper Mines (Quebec) Ltd. The property, closed for many years, is in Levy Twp., Chibougamau area and is developed to a point where 300,000 tons of ore averaging about 7% copper have been indicated. Plans call for an initial milling rate of 300 tons daily, to facilitate which a road will be built some 20 mi. from the new Chibougamau highway.

★**Production plans** are being considered by Weedon Pyrite & Copper Corp., with ore reserves of 257,120 tons averaging 34.8% sulphur, 2.09%

copper, and 1.05% zinc. Discussions involve a starting capacity of 200 tons daily. The property is in Wolfe Co., approximately 30 mi. northeast of Sherbrooke in the Eastern Townships.

★**A new copper find** is reported from the Windy Lake area, Chibougamau district, and diamond drilling is now being started. The showing is controlled by Continental Copper Mines, which holds a 60% interest, while Marbenor Malartic Mines and Callinan Flin Flon Mines have minor percentages.

★**Marcoland Mines** has been formed to explore a base metal prospect in Landrienne Township, about 10 mi. south of Amos. The principal showing is one of copper, with good values reported from surface prospecting. Initial drilling will be done this winter.

SASKATCHEWAN

★**Beaverlodge Uranium Mines Ltd.** will start immediate underground work, including shaft sinking, tunneling and diamond drilling, following discovery of promising outcrops at the Beaverlodge Lake property. The development program will continue throughout the winter. Contract for at least 3,500 ft. of diamond drilling has been awarded on recommendation of mining engineer Bruce Alexander, who reported structural conditions on the Bar 5 claim were favorable for pitchblende deposition and said that sampling should prove ore-shoot sections below the present exposures.

IN AFRICA

★**Chrome reserves of Southern Rhodesia** are sufficient to supply total world demand for several hundred years, according to Dr. E. L. Amm, a member of the Colony's Geological Survey. Annual output is now 400,000 tons of ore which sells for £13 (current exchange: $2.80) per ton, but more than half of that goes for freight. Converted to ferrochrome in Rhodesia, the 400,000 annual tons of ore would yield £20 million to £30 million. Conversion to ferrochrome would require 1,280 million annual units of electricity, more than 5 times the amount generated by the Electricity Supply Commission in 1950. However, when the Kariba Gorge scheme is complete, it alone will supply more than 2½ times the necessary 1,280 million annual units. And, "the production of ferrochrome is the only major project we have, based on our raw material, which would absorb the power output from so vast a scheme.

Dr. Amm warned, however, that ferrochrome might meet serious competition from metallic chromium produced by a new chemical method. Plans

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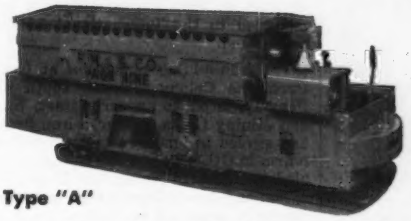

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In Africa *(Continued)*

for construction of a pilot plant using this chemical process are under consideration in the U. S., preparatory to large-scale introduction of the process, he added.

★**In the Orange Free State,** speaking of the abolition of international control of the sale of gold for manufacturing purposes, Mr. Havenga, South African Minister of Finance said, "we shall do nothing foolish or unreasonable which will jeopardize the market we have built up for this portion of our product."

The first bar of gold produced from the new Orange Free State goldfields was poured on Oct. 25 by Mr. Anderson managing director of the Union Corporation, Ltd. This first gold bar came from the Basal Reef, which is expected to be the mainstay of the new Goldfields, he said.

★**Tanganyika iron ore,** which was found near to 40 million proven tons of coal, has been successfully test-smelted in Sweden by the Krupp-Ren process. At an October 30 conference called by Sir Edward Twining, Governor of Tanganyika, Government and railway men met with H. G. Burks, a Government metallurgist who had just returned from Sweden, to discuss exploitation of the deposits, and transportation problems involved.

IN ASIA

★**The Bank of Japan** will give priority financing in the form of special low-interest loans to promising gold mines which wish to boost output. The move is intended to build up Japan's holding of gold so that the country can be admitted to the International Monetary Fund.

★**The iron-mining expansion at Goa,** Portugese Colony 300 mi. south of Bombay, is off to an early start. Kokan Mining Co., a Japanese iron firm, has agreed to lend two technicians to a firm in GOA; 12 of them were scheduled to arrive in November. Mechanization and development of the iron-ore mines is expected to cost £600,000, and is expected to increase annual output from 200,000 to 1-million tons.

★**India will spend** more than Rs 10-million in a five-year program to investigate its strategic mineral wealth, according to Dr. M. S. Krishnan, director of the Geological Survey. Large-scale geophysical exploration for minerals of chromium, sulphur and manganese will get under way in the next six months.

IN AUSTRALIA

★**Australia's promise** to increase her production of copper immediately will

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probably not be so immediate. No sizeable increase in production is in sight for about two years.

★**Entering the free-gold market** will strengthen the economic basis of Australian gold mining, but producers will insist on getting hard currency for any gold sold on the free markets.

★**Broken Hill Pty.**, in South Australia, is displaying keen interest in the extensive chromite deposits at Coombina, where the company recently pegged 170 acres of claims.

★**King Island Scheelite**, in the year ended October 20, earned more than four times as much in the previous year and in the **four weeks** to October 20, the company broke all previous records by producing **115½ tons of concentrates.**

★**In Northern Territory**, interest continues to center on tungsten.

Merloo Gold Mines N. L. expects soon to start operation of its alluvial-treatment plant in the Wauchope wolfram field.

Doria Gold Mines has shown that the main scheelite reef, which it has opened up, continues for 500 ft. The north end is in ore estimated at 20% scheelite (£500 to 600 per ton).

Territory Scheelite N. L. has acquired an option to purchase two leases, adjoining Duzettis lease, owned by Doria Gold Mines.

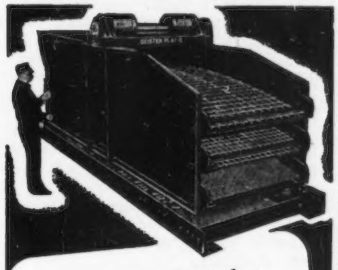
Central Scheelite N. L., has traced its reef by surface costeaning (trenching or pitting), and has shown it to extend more than 1000 ft.; it is less broken than other reefs in the Mosquito Creek scheelite field.

IN EUROPE

★**The Swedish**, state-owned Luosaavaara Kiirunavaara Ore Co. (otherwise known as Malmbolaget) plans to increase its production to 15 million annual tons by 1955 (present output: 9 million tons). The new expansion will cost about 60 million crowns in addition to the 200 million which the company had previously earmarked for converting Kiruna to underground mining. (One crown equals $0.193.) At the same time Sweden and Norway are spending 85 million crowns to improve the iron-ore railway to the port of Narvik. Shipments through Narvik this year are expected to reach about 8 million tons.

★**French output** of bauxite is rising sharply, but the export demand has risen even more sharply. Production is up to about 100,000 monthly tons, up 50% from last year's monthly average. Exports were at the 1950 level in May, but expanded 50% in May, 130% in June, 125% in July. The industry lives to a large extent by export because France does not have enough electricity.

★**New Caledonia** will increase nickel production to about 6,500 tons in 1952



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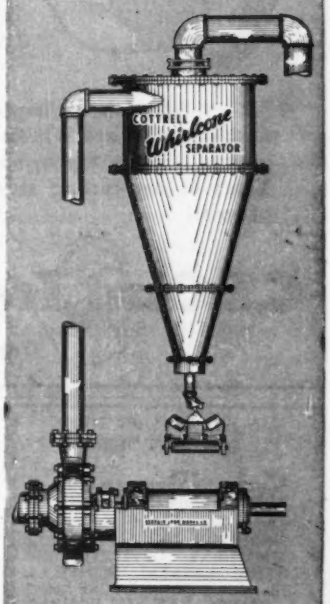

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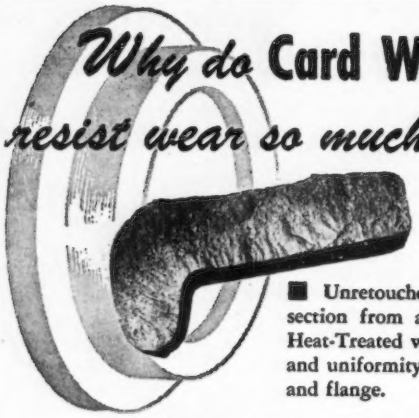

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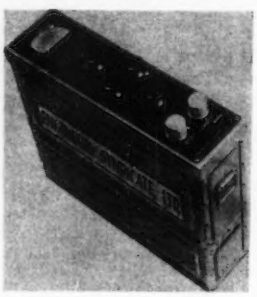

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In Europe *(Continued)*

(1950 production: 3,420 tons). **Le** Niquel, the private French firm which operates in New Caledonia, has $965,000 in Marshall aid credit. The program will include installation of modern equipment for more efficient mining of the several-hundred-million-ton and other plant improvement. In the meantime France, which is already paying 595 francs per kilo (considerably more than the international price), is thinking of boosting the price even higher.

★**United Austrian Iron and Steel Co.** (VOEST) is making rapid progress on the new Bessemer steel works at Linz, and expects to be in production late in 1952. Buildings are now going up; two of three converters will be delivered early in 1952. The plant will produce 100,000 tons yearly.

★**At Strnisce, Slovenia, Yugoslavia,** large units of machinery (rotary furnaces, boilers, autoclaves, and other units) are beginning to arrive for the new aluminum smelter. The plant will have 160 pots, and will produce 60 million lb. of aluminum starting sometime early in 1952.

★**The Greek Government** is currently considering two applications for mineral concessions: Roura and Forgas, a London firm of merchants, has applied for long-term concessions on the Laryma nickel mines. Kennecott Copper Corp. has applied for permission to operate asbestos mines in the Kozani area.

IN LATIN AMERICA

★**Word from Colombia** advises that foreign interests which wish to exploit Colombian mineral resources should be prepared to make their own geological studies; the government has not conducted to date, and has no funds for, such studies.

★**Peru's new mining code,** which was approved last year and went into effect on July 1st of this year, has marked a new era in mining. Investors, who now have a single tax to pay, (on profits), and the assurance that no additional taxes will be charged for the next 25 years, have been stimulated to the point that production of metals has increased notably.

Northern Peru Mining & Smelting Co. is installing a concentration mill at Chilete, inland from Pacasmayo, in Northern Peru, for the treatment of lead and zinc ores. The plant will have a daily capacity of 500 tons. The same concern has intensified prospecting and development work at the Toquepala and Quellaveco copper deposits, near Moquegua, in Southern Peru.

Cerro de Pasco Corporation, (formerly Cerro de Pasco Copper Corp.), has obtained a $22,000,000 loan from the Export-Import Bank, and is installing an electrolytic zinc refinery in the Department of Junin. The plant will produce 200 tons of electrolytic zinc per day.

Compañía Minera Atacocha is erecting a hydroelectric plant for its 800 ton concentrator. The plant will produce 6,000 HP.

Compañía Minera Milpo is installing a zinc and lead concentrator with a capacity of 100 tons a day. Milpo is near Atacocha.

Gulf Texas Sulphur Co. is prospecting its properties at Bayovar, near Paita, in Northern Peru, with a view toward erection of a sulphur refinery.

The Fermín Malaga Santolalla e Hijos group, which has been the largest producer of tungsten in Peru since the last war, has just obtained a loan of $250,000 from the Export-Import Bank for the erection of a concentration plant which will double the production of tungsten.

Banco Minero del Peru is installing a 100-ton mill in the Huarochirí region, inland from Lima, for the treatment of lead-silver ores. Banco is also installing an 8,000 hp. hydroelectric plant at the Chiris River, in Southern Peru, to supply energy for the Castrovirreyna, Huachocolpa and Huancavelica mining regions.

Sindicato Minero Rio Pallanga, a large producer of lead and zinc, with properties in Central Peru, near Cerro de Pasco, has increased its plant ca-

Our Defense Program Faces a Crisis

A major crisis will soon confront our defense program.

It is not a crisis in raw materials. To find enough materials, from steel to cobalt, for defense production is a serious problem. But it is one that is being solved.

It is not a crisis in manpower. Shortages of workers with special skills hamper production, but these shortages are being relieved, slowly.

It is not a crisis in manufacturing capacity. American industry's record-breaking expansion is, with very few exceptions, keeping abreast of defense needs.

The coming crisis will be one of finance. It will rise from our failure to provide the means to PAY FOR the defense program we now have under way.

A $15 Billion Deficit?

Congress has approved a defense program which is scheduled to raise *total* federal spending in the year from June, 1952, to June, 1953, to somewhere between $85 and $90 billion. Additional appropriations for more air power and atomic development, which are now proposed, would add several billion dollars.

But Congress has not approved a tax plan to match such spending. With the new levies enacted in this session, tax collections during the 1952-53 fiscal year are estimated to fall somewhere between $70 and $75 billion. That would be roughly $15 billion short of balancing the budget. If the defense program is expanded, the deficit will be that much greater.

We have not yet felt the impact of the crisis that would accompany a federal deficit of this magnitude. Federal tax collections currently are big enough to balance federal expenditures. But the defense program is scheduled to boost the annual rate of federal expenditures $25 billion in the next year.

To Meet the Crisis

By January the crisis will be clearly in sight.

Then the President will present his budget. After that, Congress must act to close the broad gap between government income and government spending. If it fails to do that, the whole defense program will be menaced by weakness in its financial foundations. That weakness might well take the form of another destructive wave of inflation.

We have three ways to meet this crisis.

The best approach, of course, is to cut unessential expenditures. That can make a real dent in the deficit. The second is to collect more

taxes. The third, and by all odds the most dangerous, is to have the federal government meet its deficit by going deeper into debt. Borrowing, which might feed inflation, can easily lead to disaster.

Near Income Tax Limits

It will not be possible to raise taxes to meet the deficit merely by increasing further the rates on corporations and on persons in the upper income brackets. Congress has about scraped the bottom of that barrel.

The Senate Finance Committee said as much in reporting this year's tax bill. The Committee reported that it had "serious doubts as to the feasibility of raising any substantial additional amounts of revenue from income tax sources." The Committee observed that recent tax legislation brings the burdens of most corporate and individual income taxpayers close to the World War II peaks, and actually carries the rates paid by many taxpayers above those peaks.

Our ramshackle federal tax system must be thoroughly overhauled in order to broaden the tax base if it is to produce more revenue—without doing much more harm than good.

The shocking fact is that no one seems ready to act along any line that might enable us to surmount the crisis.

That fact of itself aggravates the coming crisis. And next year's presidential election doesn't make it any easier to move effectively. Both parties will shrink even more than normally from backing any program that might irritate any considerable number of voters.

If we are to meet this crisis on the tax front in an orderly way, the technical work should be in progress right now. To a large extent it is being ignored.

If we are to enforce the vitally essential program of government economy, there is the same urgent need to get under way the spade work that is required.

And if—as a last miserable expedient—we decide to let the federal government drift deeper into debt, it must have a well-developed program of borrowing from individuals and other investors, such as insurance companies, rather than from the commercial banks. Borrowing from commercial banks might speedily translate the deficit into more and more price inflation. No adequate program of borrowing from savings is now in sight.

Now Is the Time

It is possible, of course, that international relations may improve sufficiently to make it safe for us to slow down the rearmament program. If that should happen, the fiscal crisis would not be so critical. But that kind of good fortune has been notably absent in recent years.

Lenin, patron saint of Communism, is quoted to the effect that to destroy a political and social system such as ours "you must debauch its money."

We shall set democracy to digging its own grave if, through our preoccupation with politics during the presidential campaign, we pave the way for further debauchery of our money.

If we really want to avert that disaster, now is the time for us to get going.

Once the crisis is full upon us, it will be too late.

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▲ **Model TD-1222H Trailer**
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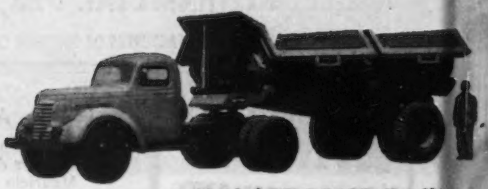

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What to look for . . .

obsolete machines, tools and equipment, no-longer-used jigs and fixtures, worn-out or broken chains, wheels, pulleys, gears, pipe, tanks, drums and abandoned metal structures. Non-ferrous is needed, too!

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In Latin America *(Continued)*

pacity from 80 to 150 tons of concentrates per day.

Mauricio Hochschild & Co. S. A. Ltda. has acquired the San Antonio de Esquilache mines, and is planning to install a 250-ton concentration plant for the treatment of lead and zinc ores. San Antonio de Esquilache, located in Puno, is a very old mine, which was worked intensively during the Spanish conquest, and later changed hands several times. It is said that reserves of low-grade ore are extremely large.

★**In the Brazilian state of Ceara, near Fortaleza, Harbison Walker Co.**, producer of materials for industrial furnaces, has been authorized to operate large magnesite deposits through a Brazilian subsidiary, Harbison Walker Mineiros Ltda.

★**In Mexico,** the government has agreed to mint 65 million pesos worth of silver coins for Saudi Arabia. That brings Saudi's total to date to almost 200 million pesos worth.

Petroleos Mexicanos (Pemex) made its first sulphur export, 1,500 tons, to the U. S.

★**The Chilean Government** has announced that early in 1950, two U. S. AEC geolgists, Lee and Rappaport, accompanied by two Chilean colleagues, Ruiz and Hevia, examined deposits thought likely to contain uranium, and found pitchblende in two old high-temperature copper camps: Carrizal, north of Vallenar; and Tambillos, south of La Serena. Chile is considering legislation to reserve exploitation of radioactive minerals, and has commissioned geologist Ruiz to examine the deposits that AEC reported favorably.

The Paipote smelter started operations in November with a stock of about 20,000 tons of copper and gold ores. It has arranged to buy about 4,000 monthly tons of 30% copper concentrates.

The first unit of Chile Exploration Co.'s new flotation mill is expected to be ready about May, 1952. Because the smelter will not be ready until later, concentrates will be stockpiled.

Surface sulphur deposits of sulphur are being processed by flotation to produce 85% concentrates (several plants), and are then refined to 99.5% by steam treatment in autoclaves.

IN THE PHILIPPINES

★**Lifting of the gold ban has had a** detrimental effect on the Manila free-gold market. Traders fear an influx of additional gold, mainly from Canada, Australia, and South Africa.

★**The Hixbar property,** an important prewar copper producer, has made a comeback. After heavy expenditures for new equipment and construction, the company reported a profit for the year ending in July from the property on Rapu-Raper Island near Legaspi.

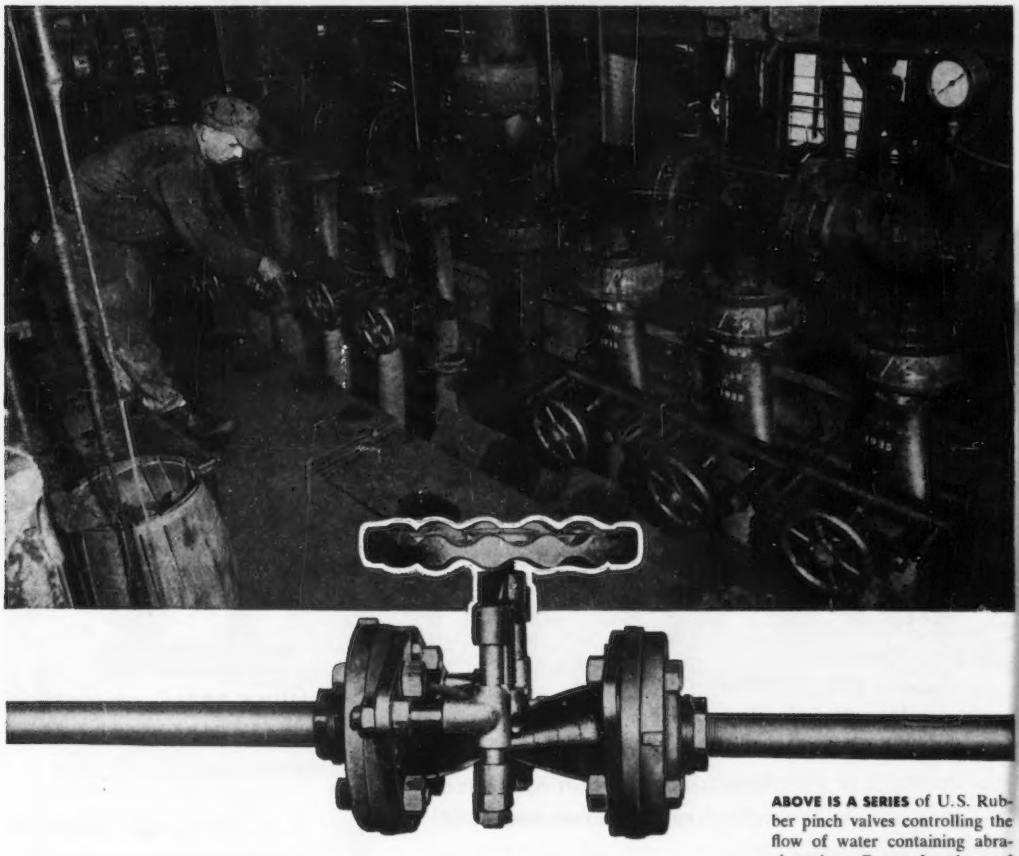
★**Natives discovered manganese-stained gold ore,** typical of the good ore found in old Antamok veins, at property of Antamok Goldfields. Quite a rush, illegal because it was on the company's property, developed before the company could put a stop to it.

★**Samar Mining Co.** has taken over an iron deposit at Pili on Marinduque Island, and has at least 200,000 tons of huge hematite boulders in sight. Prospecting has disclosed an orebody carrying 61% iron, low in phosphorus and silica.

★**Dean Conrado Benitez** and associates have filed claims on a vast area of manganese deposits in Rizal province. Grade averages 50.69%, and the deposit is only about 2½ mi. off a road which leads 7 mi. to Laguna Bay, from where ore could be shipped by barge to Manila. This Rizal deposit is closer to Manila than any previous manganese finds.

★**Marsman & Co., Inc.** has started operations at both Coco Grove and Itogon, according to J. B. Stapler, manager of mines division of the company. At both properties, crews were trained at the same time as equipment was given its shakedown.

What does U. S. Rubber's pinch valve do for the coal industry?



ABOVE IS A SERIES of U.S. Rubber pinch valves controlling the flow of water containing abrasives in a Pennsylvania coal preparation plant. Many of them have been in continuous operation for over 16 years. Below the photo is the newest of the U.S. family of pinch valves, shown in a closed position. Sizes range from 1½ inches to 8 inches.

The new "U.S." pinch valve outwears metal when installed in pipe lines carrying abrasive or corrosive mixtures. Its flexibility offsets misalignment in pipes, absorbs vibration, breaks up galvanic action in pipes, eliminates "water hammer" and offers a positive seal in a closed position. The metal parts of the valve can be refitted to new valve bodies, thereby reducing replacement costs.

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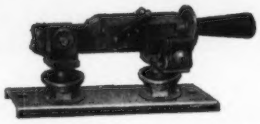

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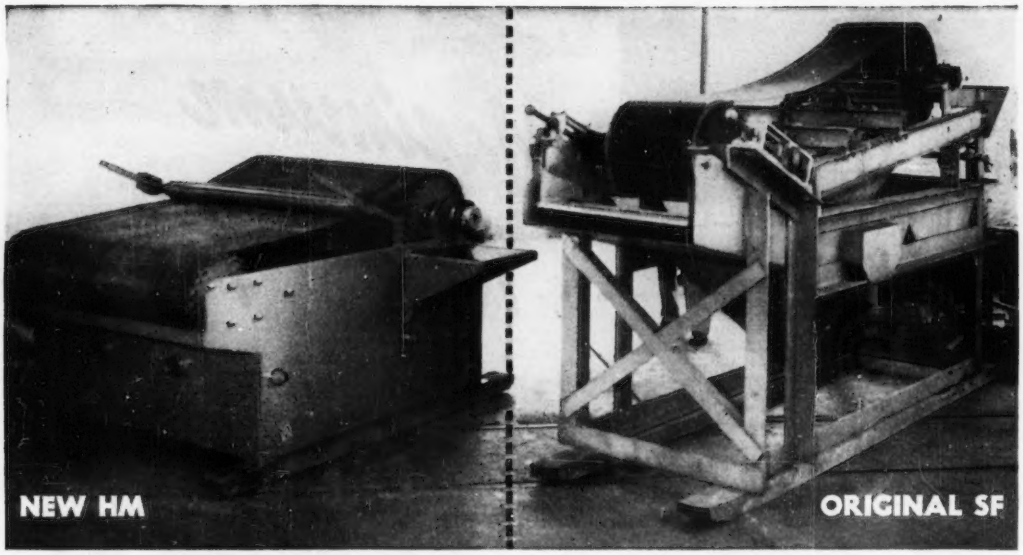

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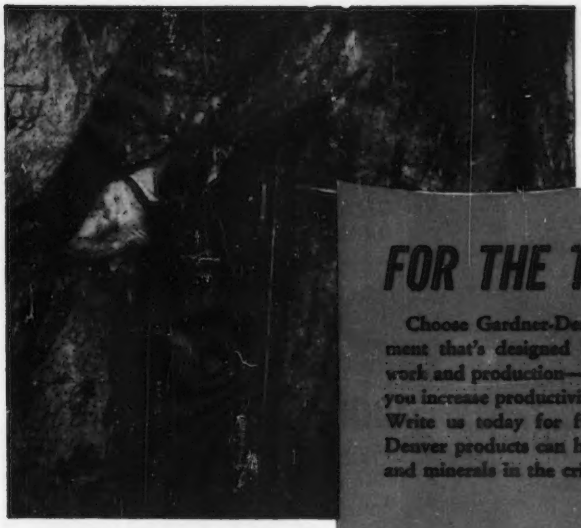

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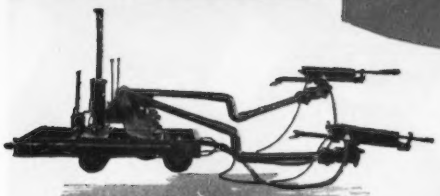

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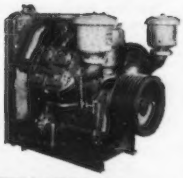

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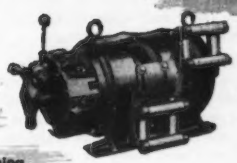

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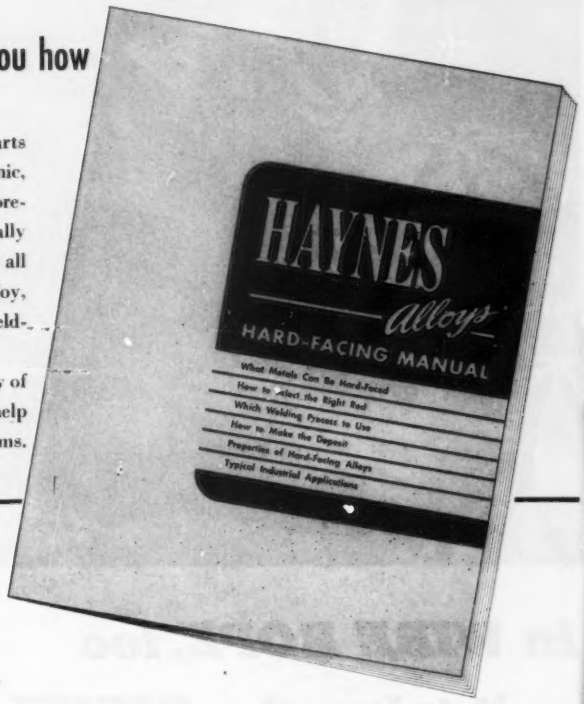

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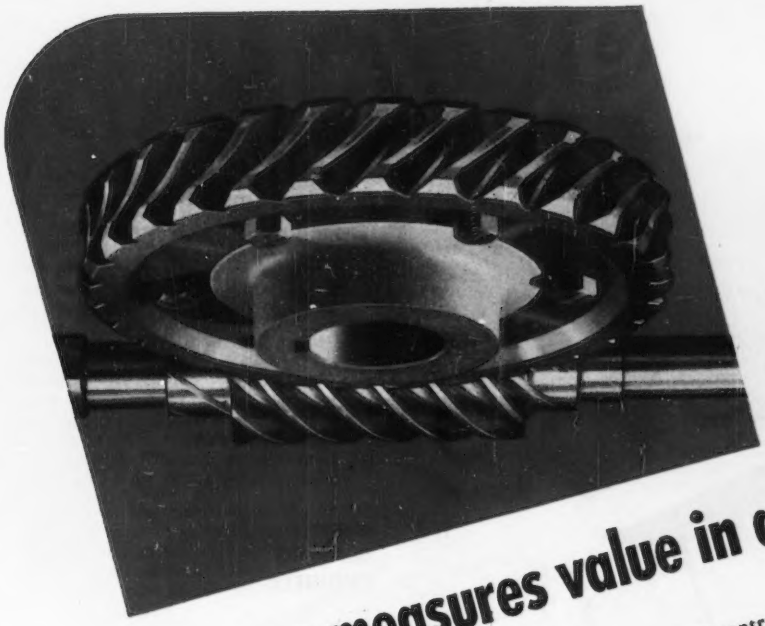

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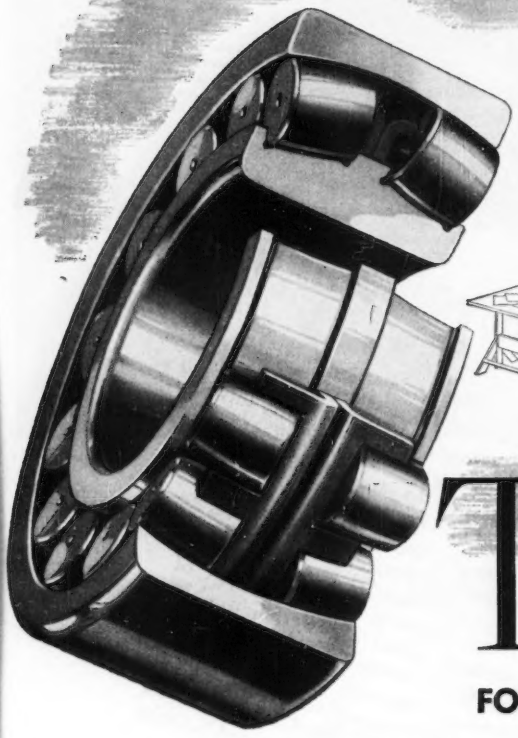

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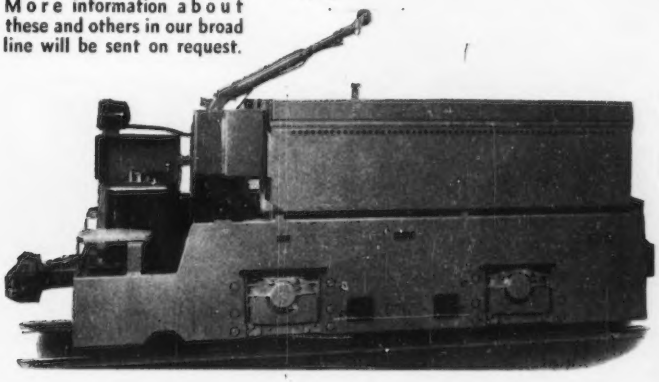
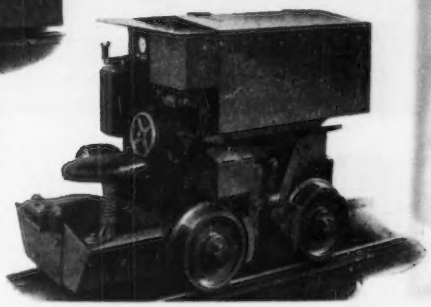
For haulage and tramming in the Metal Mine we show three types on this page. More information about these and others in our broad line will be sent on request.

Jeffrey 6-ton, round-end Trolley Locomotive with two 30 H. P. motors. 24" gauge; 33" wheels; 54" height with trolley pole locked down; length is 13'8"; width 46" and wheel base 48". This is a neat, compact job for handling your haulage operations.



Jeffrey Storage Battery Locomotive — 12,000 pound chassis and 30" gauge. Two 30 H. P. motors—two-rate battery charging from trolley—60" high with trolley locked down; wheel base 56"; length 7'2"; width 52". This combination trolley and storage battery locomotive will give you years of service under the severest conditions.

The Jeffrey Trammer (below) is a 1½-Ton compact unit—can be arranged for trolley, storage battery or cable reel operation. Has a 6 H. P. motor; short wheel base (only 26") to take sharp curves; compact construction to meet gauges down to a minimum of 18"; water tight construction; operator's deck can be removed to shorten length for entering cage.



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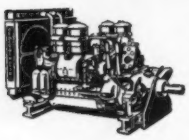

"The Twin 6 General Motors Diesel in our Marion Shovel has given her the drive she needed to keep her on some of our toughest jobs," says Mr. Charles Dewees, Manager of Dewees Bros., Kingston, Pa.

Mr. Dewees reports the shovel strips 250 yards of heavy overburden per hour and has been operating 10 hours a day for more than two years. "For us it has been a good, trouble-free combination."

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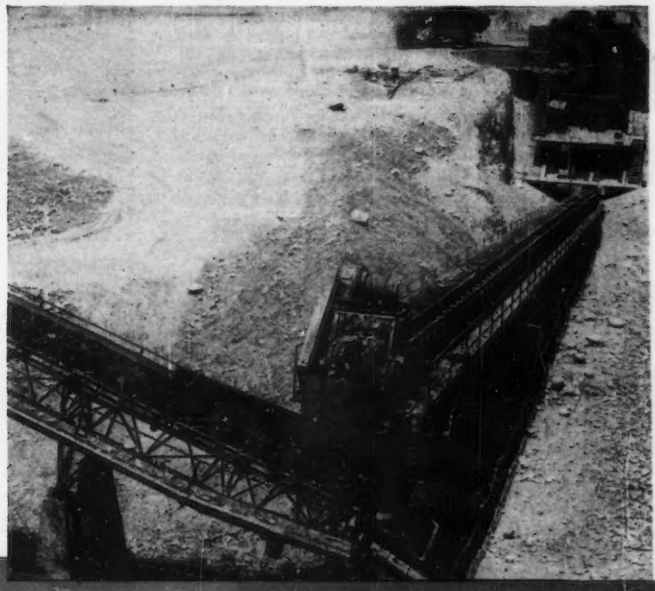
Redi-Fab BELT CONVEYORS



EASY SELECTION FROM CATALOGED UNITS

Experience has shown that most of your belt conveyor requirements are met by units that form a specific segment of the vast Barber-Greene Conveyor line. That segment is the Redi-Fab series—the conveyor sizes you most frequently need. These conveyors have been expertly and conveniently cataloged in a wide variety of small increments of width, length and horsepower. Redi-Fab series components—truss sections, drives, takeups, power units, terminals and complete connections—are "packaged" for off-the-shelf delivery.

FAST QUOTATION, DELIVERY, ERECTION

Actually, you can select your Redi-Fab Conveyors, and order the proper components, directly from Catalog RF—an entirely new approach to conveyor selection. Better still, work with your B-G distributor representative. Without costly time-consuming engineering, you can choose the conveyor that exactly meets your needs. Quotation and delivery are faster because you select from standard, pre-built units normally available from distributor or factory stock. Erection is simpler—all units are delivered clearly marked for fast, easy assembly.

NOW More than ever, machines must be used most effectively. Redi-Fab Conveyors offer the fast, sure way to release shovels, cranes, tractors and the like for more productive work — to minimize man power requirements and increase productivity. Send for your copy of Redi-Fab Catalog RF.

Barber-Greene Company

Aurora, Illinois

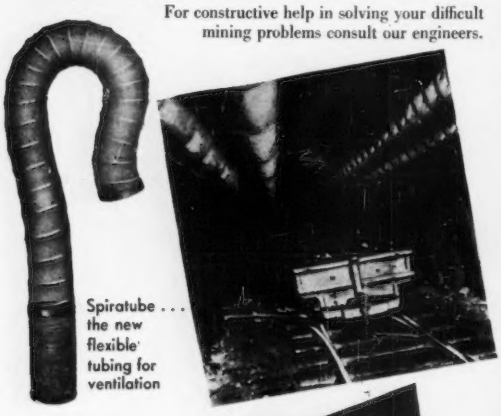
DIGGING FOR PROFITS?

They'll carry the load!

Here's mining equipment designed by men who have solved many difficult mining problems in many different parts of the world . . . mining equipment manufactured by a company with over 50 years' experience in serving the mining industry! Only a few examples of the many types of mine cars manufactured are shown here.

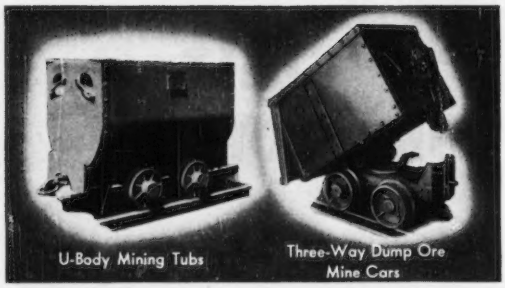
To mining engineers concerned with the increasing costs of mine operation, "Pressed Steel Car Company" equipment will give dependable, efficient, trouble free service.

For constructive help in solving your difficult mining problems consult our engineers.



Spiratube . . . the new flexible tubing for ventilation

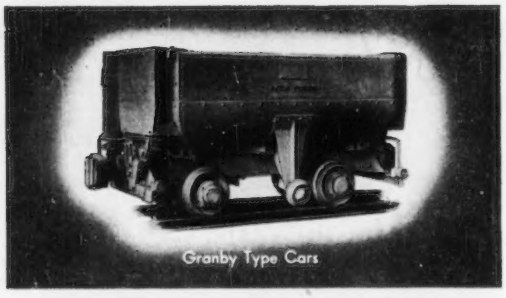
Mining Locomotives



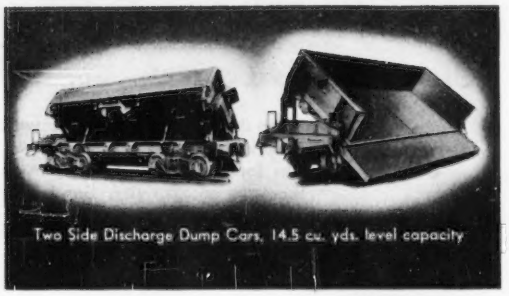
U-Body Mining Tubs

Three-Way Dump Ore Mine Cars

Track work and car parts



Granby Type Cars



Two Side Discharge Dump Cars, 14.5 cu. yds. level capacity

Other Products...

WEST VIRGINIA STEEL and MANUFACTURING CO.
Steel rails, steel crossties, track accessories, switches, crossings, frogs, etc.

THE FATE-ROOT-HEATH COMPANY
Brick manufacturing machinery.

PLYMOUTH LOCOMOTIVE WORKS
Internal combustion motor locomotives from 3 to 70 tons (alcohol, gasoline, Diesel and Diesel-electric).

WOOLERY MACHINE COMPANY
Weed burners, gang cars, rail motor cars.

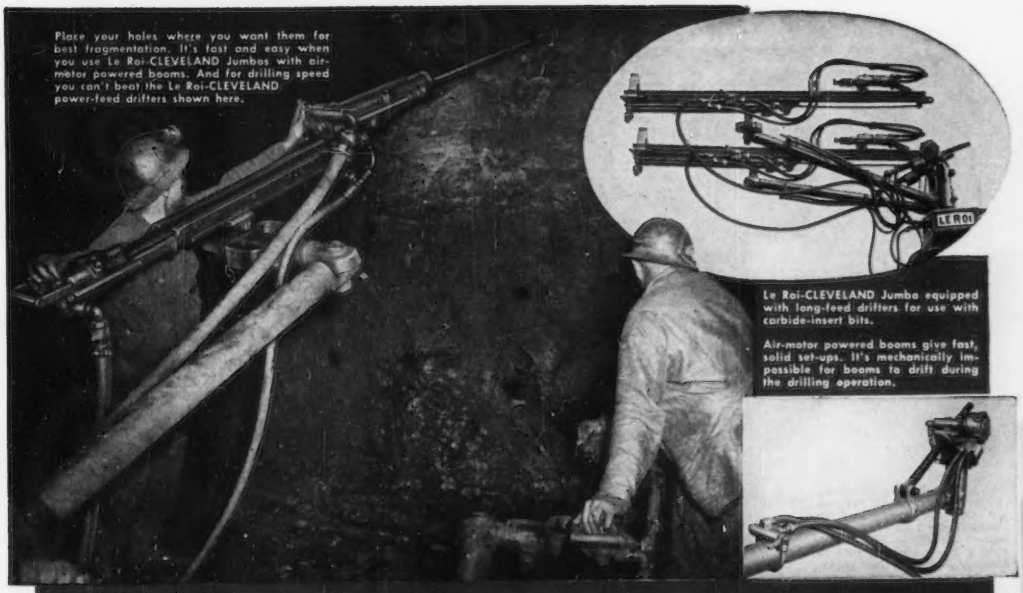
FLEXIBLE TUBING CORPORATION
Flexible Tubing.

PSC

Steelcar

PRESSED STEEL CAR COMPANY, Inc.

Export Division, 25 Broad Street, New York 4, N. Y.


Place your holes where you want them for best fragmentation. It's fast and easy when you use Le Roi-CLEVELAND Jumbos with air-motor powered booms. And for drilling speed you can't beat the Le Roi-CLEVELAND power-feed drifters shown here.
LE ROI
Le Roi-CLEVELAND Jumbo equipped with long-feed drifters for use with carbide-insert bits.
Air-motor powered booms give fast, solid set-ups. It's mechanically impossible for booms to drift during the drilling operation.

Drilling-Cycle Time Reduced, Footage per Shift Increased

. . . when you use Le Roi-CLEVELAND Jumbos and power-feed drifters in your rock headings

THERE are three things you have to do if you want to save time in your drilling cycle and increase your footage — reduce set-up time, drill out the round faster, and shorten tear-down time.

You know this and so do we. That's why we designed the Le Roi-CLEVELAND jumbo the way it is. And that's also why our drifters drill so fast.

Let's see what you get when you use Le Roi-CLEVELAND:

★ The most flexible jumbo available. Air-motor powered booms let you space your holes quickly and easily for most efficient fragmentation.

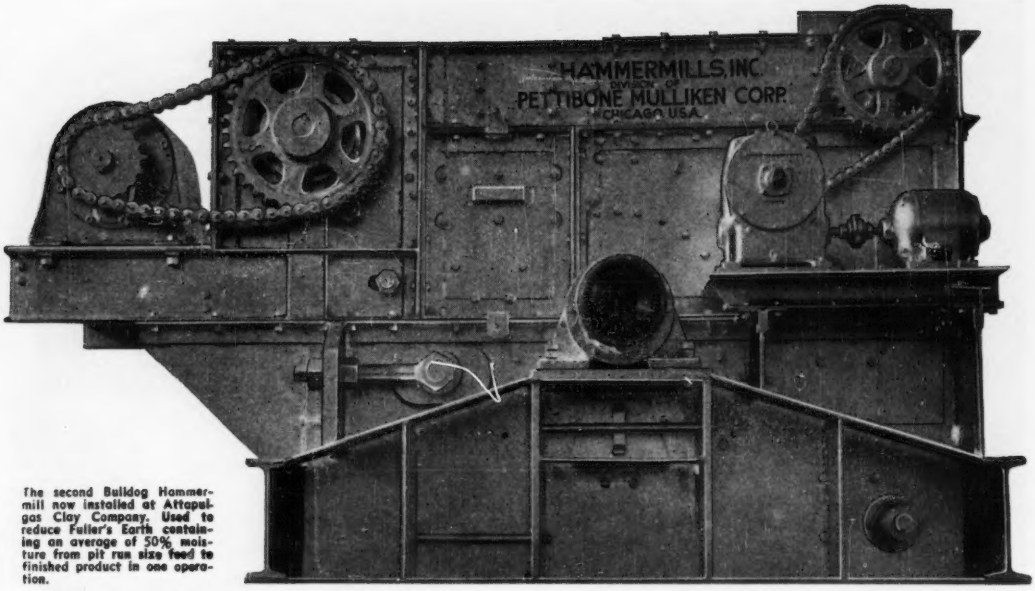
★ Rigid, non-slip set-up feature keeps drifters in line, prevents steel binding, saves wear and tear on chucks, results in higher average drilling speeds.

★ Strong rotation, plus snappy yet powerful force of blow of Le Roi-CLEVELAND drifters gives you unexcelled drilling speed. This drilling speed coupled with the fast, positive feeding action of our power feed gives you the right pressure for fastest drilling and reduces drill-steel changing time.

You add all these advantages together when you use Le Roi-CLEVELAND jumbos and power-feed drifters. The outcome is faster drilling cycles, more footage per shift—so why not standardize on these cost-cutting honeys. Write for complete information.

LE ROI COMPANY RD-42

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, Ohio

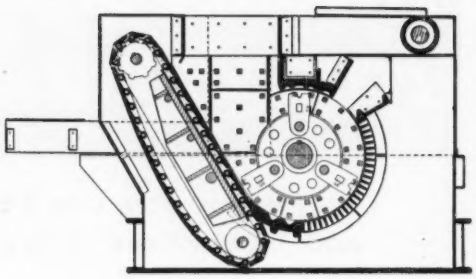


The second Bulldog Hammermill now installed at Attapulgas Clay Company. Used to reduce Fuller's Earth containing an average of 50% moisture from pit run size feed to finished product in one operation.

BULLDOG HAMMERMILL

with moving Breaker Plate

For wet, sticky material reduction . . . for those tough, heavy-duty crushing jobs.



Illustrated above is the last word in Moving Breaker Plate Hammermill design. It is built by an engineering organization whose experience far surpasses any organization that might furnish Moving Breaker Plate crushing equipment.

Design Improvements have increased reduction efficiencies and lowered H.P. requirements. You can see this equipment in operation at any time. Also Hammermills will gladly survey your reduction requirements and recommend the proper equipment without cost or obligation. Just write or call.

Bulldog Hammermills are built in capacities up to 1000 tons per hour for every purpose: for primary, secondary, fine reduction of materials such as limestone, shale, Fuller's Earth, phosphate muck, phosphate mud balls, iron ore, oyster or clam shells, any reducible material.

HAMMERMILLS, INC. • 4782 W. Division St.
Chicago 51, Ill. • Phone Spaulding 2-9300

division of

PETTIBONE MULLIKEN CORP. • 4700 W. Division St.
Chicago 51, Ill. • Phone Spaulding 2-9300

"and from the best makers, lady!"

These are well made and give dependable service, the sidewalk merchant implies. Was there ever an eager salesman who didn't!

To the men who order more than 85 per cent of all Multiwall bags, reliability of manufacturer is one of the most important considerations*.

But it must be a *proved* reliability.

Union reliability has been demonstrated by 76 years of unbroken leadership in paper packaging. Union's mammoth Savannah plant, world's largest integrated pulp-to-container mill, produces Multiwalls by the million.

Capacity and fair treatment are among the many good reasons why, with a free choice of all Multiwall manufacturers, major buyers are specifying UNION Multiwalls to a greater extent than ever before.

More so every day . . .

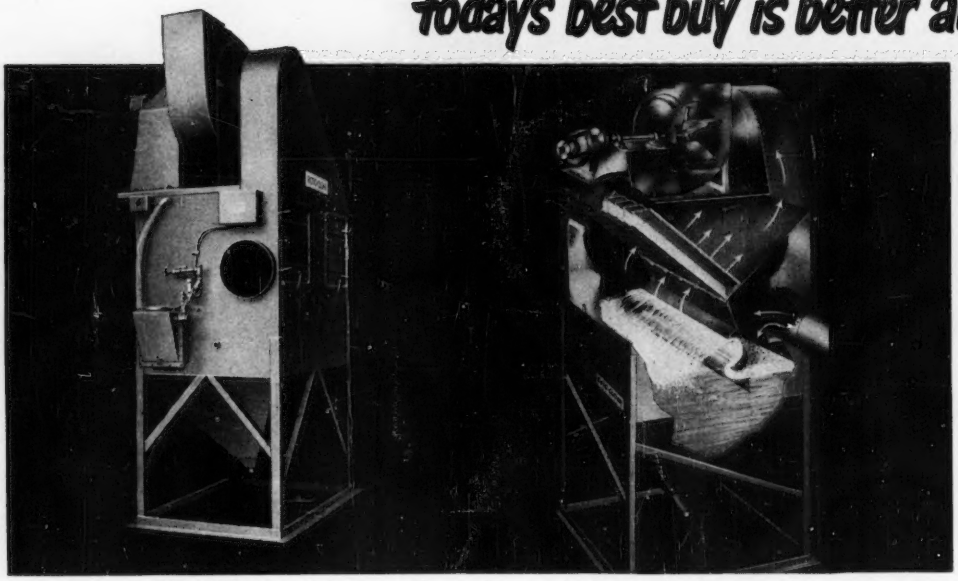
IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 *research study.*

UNION BAG & PAPER CORPORATION • WOOLWORTH BUILDING, NEW YORK 7

today's best buy is better air!



ROTO-CLONE Type N Arrangement D . . . and cutaway showing operation of water curtain.

here's the "last word" on

WET TYPE COLLECTORS!

ROTO-CLONES* ***provide four major advantages in eliminating dust from mining operations.***

1. Efficiency—better than 98% on small micron particles even in heavy concentrations. This is the daily operating record of scores of Type N and Type W ROTO-CLONES now servicing many kinds of mining operations.

2. Low Cost—a ROTO-CLONE wet collection system costs no more than other dust collectors of comparable efficiency. However, its small space requirements and factory method of assembly reduce installed costs. Operating features also reduce maintenance. The ROTO-CLONE system of bringing the dust to the water makes effective use of every gallon supplied.

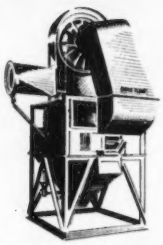
3. Uniform Air Delivery—the exclusive ROTO-CLONE engineering features supply constant air volumes and continuous efficiency dust control.

4. No Secondary Dust—ROTO-CLONES eliminate rehandling and disposal of dry dust. Dust is collected in sludge form within the self-contained unit and may be disposed of in several ways. For one . . . it may be sluiced, either intermittently or continuously.

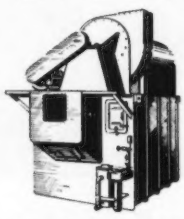
The principle applications for wet-type collectors in the mining field are • Ore Crushing • Screening • Material Drying • Conveyor Transfer • Milling • Sampling • Roasting • Sintering.

For complete information on the many ROTO-CLONE types, sizes and applications call your nearby AAF representative or write for Engineering Bulletin No. 270A.

**ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*



Type W ROTO-CLONE



Type N ROTO-CLONE Arrangement B

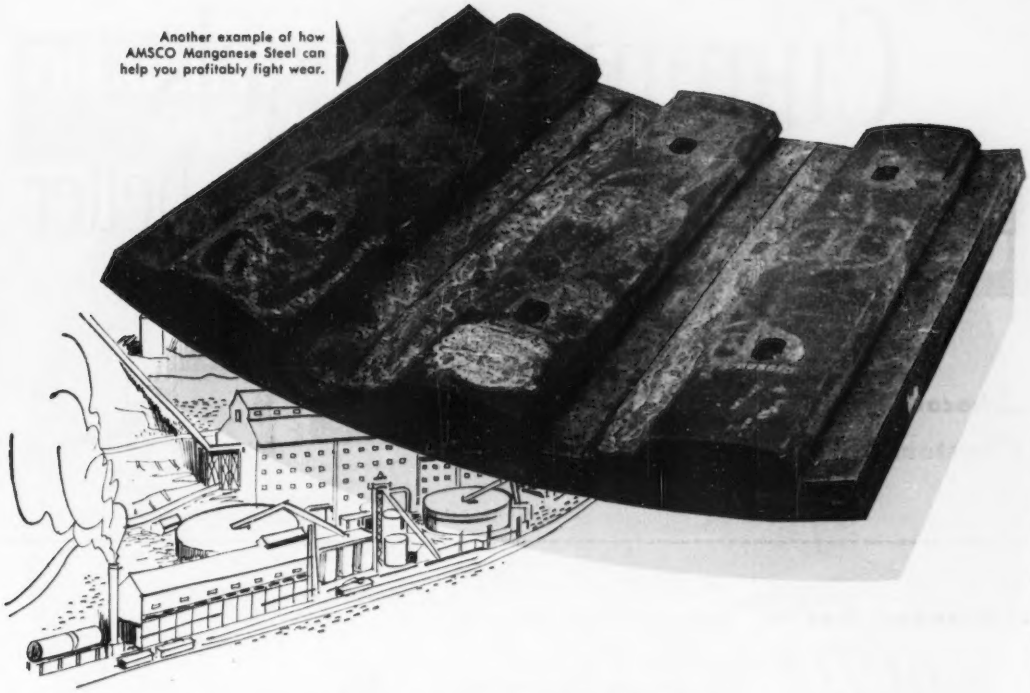
AAF

American Air Filter

COMPANY, INC.

193 Central Ave., Louisville 8, Ky. • In Canada: Darling Bros., Ltd., Montreal, P. Q.

Another example of how AMSCO Manganese Steel can help you profitably fight wear.



These LINERS lasted 6 times longer

How AMSCO Manganese Steel increased production . . . lowered costs per ton

A large Western mine had a problem that's all too common . . . Rod Mill Liners that lasted approximately 100,000 tons before an expensive replacement job was necessary.

In July of 1949 something new was tried. This mine installed AMSCO Liners equipped with a specially designed renewable lifter. Result? The AMSCO Liners milled 640,208 tons . . . over 6 times the tonnage of the liners formerly used. There were two important reasons for this tremendous increase in service life:

1. The liners were made of AMSCO Manganese Steel, the toughest steel known for high resistance to abrasion and impact.

2. The overlapping type AMSCO Renewable Lifters took the brunt of the load—reduced the need for replacing the more expensive liners. The lifters alone milled 340,322 tons . . . over 3 times more than the old installation!

WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar saving Manganese Steel made by AMSCO . . . world's largest producer of Manganese Steel Castings for all industry.

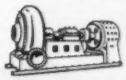
AMSCO controls impact and abrasive wear in 5 basic industrial operations:

Power Transmission

Mining and Excavating

Transportation

Crushing and Pulverizing



Materials Handling

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.

Cummins® Diesels
do so many jobs-so much better

Shovels, cranes, industrial locomotives

Drilling rigs, centrifugal pumps, generator sets

Buses and on-highway trucks

...because they're custom-built to fit the job

Earthmovers, logging yarders and loaders

Off-highway trucks, crawler tractors

Work boats, pleasure craft

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

---

...because they're

BUILT NOT ONCE BUT TWICE

Rugged, lightweight, high-speed Cummins Diesels are at work everywhere. Each engine is built *twice*. It's assembled, run-in tested, disassembled and inspected, then reassembled and tested again. This extra care in building, plus Cummins exclusive fuel system and an efficient and expanding service and parts organization, means minimum "down time", more power and profits for the user. See your Cummins dealer.

CUMMINS Diesel DIESEL

TRADEMARK REG. U. S. PAT. OFF.

Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

Export: Cummins Diesel Export Corporation • Columbus, Indiana, U.S.A. • Cable: Cumdiex

PHILADELPHIA HERRINGBONE SPEED REDUCERS

Any Reduction Ratio

Triple Reduction
Ratios from 78 to 1 up to 292 to 1.
Double Reduction
Ratios from 11.3 to 1 up to 70 to 1.
Single Reduction
Ratios from 1.75 to 1 up to 10 to 1.

Used throughout the World

With the proper selection of a Philadelphia Herringbone Reducer, practically any requirement can be provided with the correct operating speed. Three reduction types, determined by the number of gear trains used, make this range of selectivity possible. All units are designed either for **heavy**, or for **extra heavy** overhung loads.

Philadelphia Herringbone Units embody a symmetrical design—providing simplicity and strength. Standard bearings on each shaft share the load equally, and **Balanced** gear design reduces shaft stresses and eliminates end thrusts.

Efficiencies range from 96% with the triple reduction type to 98% in the single type.

Complete details of Philadelphia Herringbone Reducers are contained in Catalog H-49 . . . Copy will be sent upon request . . . please use your Business Letterhead.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

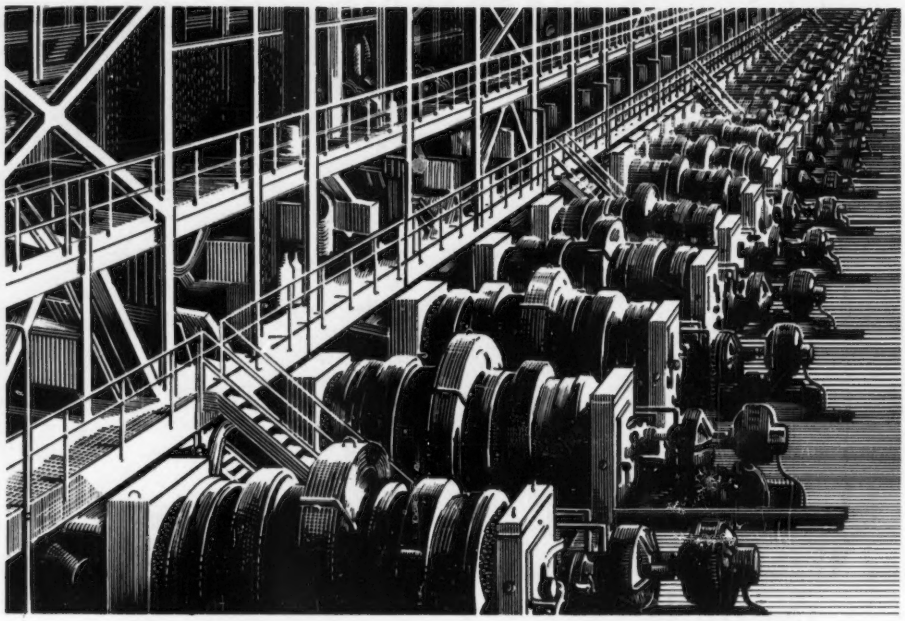
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

LEADING NICKEL PRODUCER USES MARCYS EXCLUSIVELY

57 MARCYS IN 26 YEARS PROVE LOW-COST-PER-TON PERFORMANCE



Like many metal producers, large and small, this important nickel company uses Marcy Mills exclusively. Since the first Marcy was installed by this company in 1925, they have ordered a total of 57 Marcy Ball and Open End Rod Mills.

For 26 years these Marcys have proved their ability to provide the required grind at lowest cost-per-ton. You, too, can have the proved advantages of Marcy performance... our grinding specialists will welcome the opportunity to show you actual operating data from installations where the grinding problems are similar to yours. Call or write.

AVOID OVERGRINDING, or EXTENDED GRINDING . . .

USE MARCY'S PRINCIPLE of RAPID CIRCULATION of MILL CONTENTS

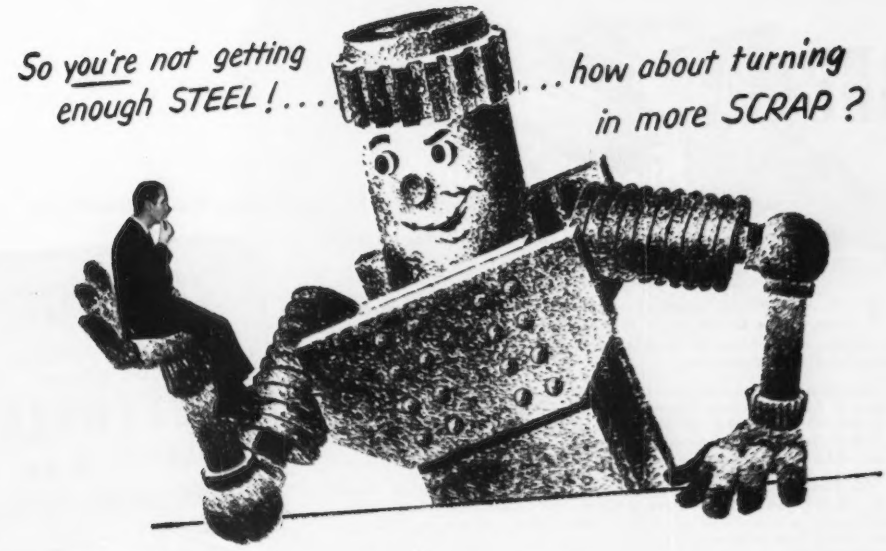
Other MASSCO products: Massco-Fahrenwald Flotation Machines, Genvise Wilfley Tables, Massco-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.

The Mine & Smelter Supply Co.

Box 5270, Terminal Annex, Denver, Colo., U.S.A.

Offices in Salt Lake City, El Paso, 1775 Broadway, N. Y. C.

Canadian Vickers, Ltd., Montreal, Can.; W. R. Judson, Santiago, Chile; The Edward J. Nell Co., Manila, P.I.; The Austral Otis Eng. Co., Ltd., So. Melbourne, Austr.; Morgardshammars Mek. Verkstads Aktiebolag, Morgardshammar, Sweden, The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., representatives for Continental Europe.



There's only one quick way to get more steel!

...get more SCRAP to the mills, at once

LET'S be realistic about the scrap shortage. The need for scrap is desperate. It threatens to hamper our whole National Defense effort—and it vitally concerns *you* because it boils down to this:

Unless 100,000 tons of industrial scrap roll into the steel mills every day, steel production will drop, and there'll be *less* steel for everyone—you included.

On the other hand, if more scrap is turned in, more steel will be turned out—and the more steel that's made the more steel *you'll* get.

So—if you want more steel—do your full share in getting your scrap back to the mills. Comb through your plant, again and again. Tap every source of dormant scrap. Dig out every retired machine that you can possibly spare and rush it to your scrap dealer. Rip out any old rails and switches that are rusting away on unused sidings—and scrap them. Scrap your antiquated dies, jigs and fixtures, your worn-out tanks and boilers that are gathering dust in some forgotten corner. Make sure that not a single pound of scrap is by-passed. Sell it—ship it. It means good money for you, more scrap for the Nation's scrap pile, and more steel for *everyone*.

• • •

Remember—the Nation's productive effort depends primarily on steel—and steel depends on SCRAP . . . *your* scrap. Turn it in—NOW.

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

U·S·S CARILLOY STEELS

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

1-1902

UNITED STATES STEEL

FREE

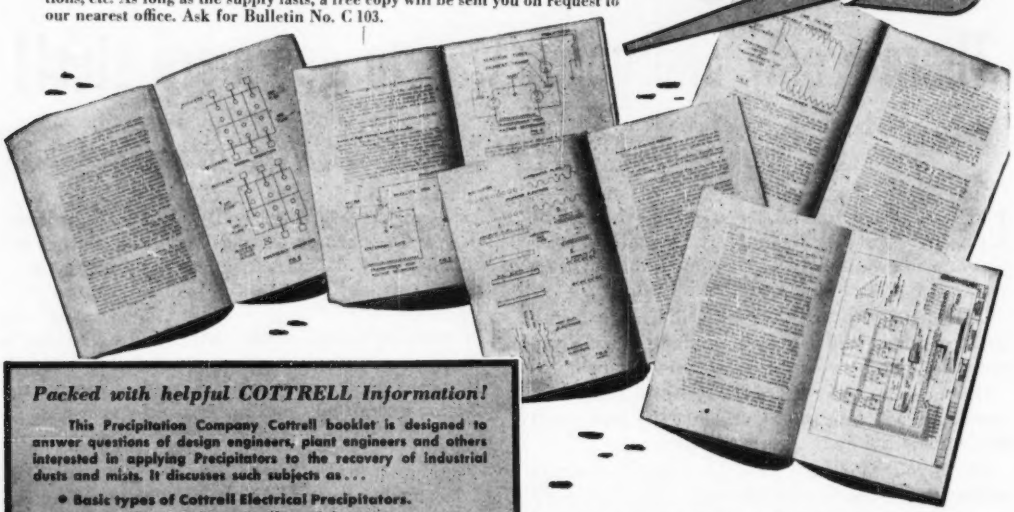
From Precipitation Company—the organization that pioneered the commercial application of Cottrell Precipitation...

IF YOU ARE ENGAGED in any phase of industry where the recovery of dusts, fumes, fly ash, mists, fogs or other suspensions from gases is a problem, you will find this booklet on the COTTRELL Electrical Precipitator helpful and informative.

Precipitation Company pioneered and installed the first commercial application of the well-known COTTRELL Electric Precipitator—Dr. Cottrell, the inventor, being a member of the company. And for more than 43 years Precipitation Company has consistently led in developing new COTTRELL advancements and techniques for recovering suspensions from gases, both wet and dry.

This free 28 page booklet summarizes many of the basic facts you should know about modern COTTRELL Precipitators—the various types available, how they operate, principal types of electrode systems and rectifiers, shell constructions, etc. As long as the supply lasts, a free copy will be sent you on request to our nearest office. Ask for Bulletin No. C 103.

28 PAGES
of helpful facts to know about
COTTRELL ELECTRICAL PRECIPITATORS



Packed with helpful COTTRELL Information!

This Precipitation Company Cottrell booklet is designed to answer questions of design engineers, plant engineers and others interested in applying Precipitators to the recovery of industrial dusts and mists. It discusses such subjects as...

- **Basic types of Cottrell Electrical Precipitators.**
- **Principal parts of a Cottrell Precipitator.**
- **Mechanical and Electronic Rectifiers.**
- **Various types of Collecting Electrodes (rod curtains, corrugated plates, dual plates, pocket electrodes, etc.).**
- **Removal of Collected Material.**
- **Factors in Shell Construction (steel, concrete, brick, etc.).**
- **Operating Efficiences and the Effect of Various Factors on Performance.**

...and many other basic Cottrell facts. Write for your free copy of Bulletin C103 today while supplies are adequate!

The above typical pages indicate the type of technical data and helpful illustrations contained in this booklet on COTTRELL Precipitators—data based on over 43 years of development work and first-hand engineering experience originating with the first commercial application of COTTRELL equipment.

NOW SELLING...

COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of Canada and other countries.

WESTERN
Precipitation
CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. LaSALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

Can You Use the "UTILISCOPE"?

The advertisement at the right appeared in BUSINESS WEEK. It has been suggested that this ad contains considerable food for thought for the readers of ENGINEERING & MINING JOURNAL also. The steel making application illustrated here may not interest you but it probably will suggest other uses for the "Utiliscope" in your operations.

If you want to look into the possibilities of the "Utiliscope", simply write us for a copy of Bulletin 1025H which explains the equipment and shows various applications. Please address your request to Department "H".

Diamond Power Specialty Corporation
Department "H"
Lancaster, Ohio

NOW You Can *See* Where You Can't *Look*

Eliminating Hazards and Reducing Costs

IN STEEL MAKING with the

DIAMOND "UTILISCOPE"

(WIRED TELEVISION)

Continuous casting of billets is a process which promises very important reduction of steel making costs. Formerly, a man had to stand close to the stream of molten steel watching the surface of the metal in the mold and always ready to signal the operator 50 feet away. The hazard was great and discomfort from radiant heat quickly became unbearable.

Now, a "Utiliscope" (wired television) camera with a long focal length lens is placed above the metal surface. The viewer is placed at the control panel. The operator can see everything that happens at close range in comfort and safety . . . can watch more effectively than a man close to the molten steel.

This is one of the many applications where the Diamond "Utiliscope" promotes safety . . . improves operation . . . saves labor. The "Utiliscope" extends the power of the eye so you can see around corners, through walls, into fire and through water. It is simple and easy to use. Installation requires no special skill. Adjustment of focus, brilliance and contrast is quickly and easily made.

You may have a place where the "Utiliscope" will save you money, or solve a difficult problem. Write for Bulletin 1025 with complete description; it suggests many possible uses.

OTHER USES

- Studying destructive tests of engines
- Checking remote gage readings
- Observing conditions inside furnaces
- Viewing nuclear research
- Coordinating material flow on conveyors

The "Utiliscope" (Reg. U. S. Patent Office)

WRITE FOR BULLETIN 1025 H

Since 1903, Diamond has Manufactured Quality Equipment for Industry

DIAMOND POWER SPECIALTY CORP.
First in Industrial Television
LANCASTER, OHIO
DIAMOND SPECIALTY LIMITED
Windsor, Ontario

How to read with your eyes open for Business!

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off—by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyers' guide. Read the ads as well as the articles. That's reading with your eyes open for business.

McGRAW-HILL
publications

Ask any Blaster what he wants from a shot and he'll tell you "Good Digging." Ask him how he gets it and he may say: "Well, for example, when we were shooting . . ." and go on with a blow-by-blow description of a particular job.

Every job is different except for one thing: **"We hooked up and detonated with Primacord."**

Primacord is the *proved* and *approved* detonating fuse that makes better blasting possible, with less hazard, shorter loading time, better fragmentation. Insensitive to stray currents, it's ideal for large mechanized operations in stripping, quarrying and open pit mining. It detonates the full charge in every hole and hooks up all holes with knots and hitches in a planned sequence that insures *good digging.*

Plain Primacord for shallow holes and surface trunk line use. Weight 1,000 ft. spool 19 lbs.; tensile strength 113 lbs.

Reinforced Primacord for deep holes and resistance to abrasion. Weight 1,000 ft. spool 20 lbs.; tensile strength 160 lbs.

Wire Countered Primacord for deep ragged holes. Brass wire armored. Weight 1,000 ft. spool 35 lbs.; tensile strength 220 lbs.

Plastic Reinforced Primacord for deep, wet holes, river crossings, etc. Weight 1,000 ft. spool 22 lbs.; tensile strength 250 lbs.

Ask your explosives supplier, or write direct

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT
Also Safety Fuse since 1836

Use PRIMACORD®
THE PROVED AND APPROVED DETONATING FUSE

FROM original idea to performance-guaranteed installation, each Chemico process is carefully tested and developed in these well-equipped laboratories and pilot plant.

On new processes, pilot plant or semi-commercial scale operations are conducted until they are fully proven. As a result, "growing pains" are radically reduced, proper construction materials can be selected and equipment sizes calculated for large scale commercial operation.

By means of these step-by-step, developmental methods, Chemico has given industry the drum-type, flash film and high temperature acid concentrators, the hot coke sludge conversion process, a new sulfur recovery process, economical plants for recovering alkylation spent acid and pickle liquor, and many other well-known and widely accepted processes.

Today, Chemico laboratory technicians and pilot plant operators in Linden, N. J. are busy proving out ideas that promise much for the future.

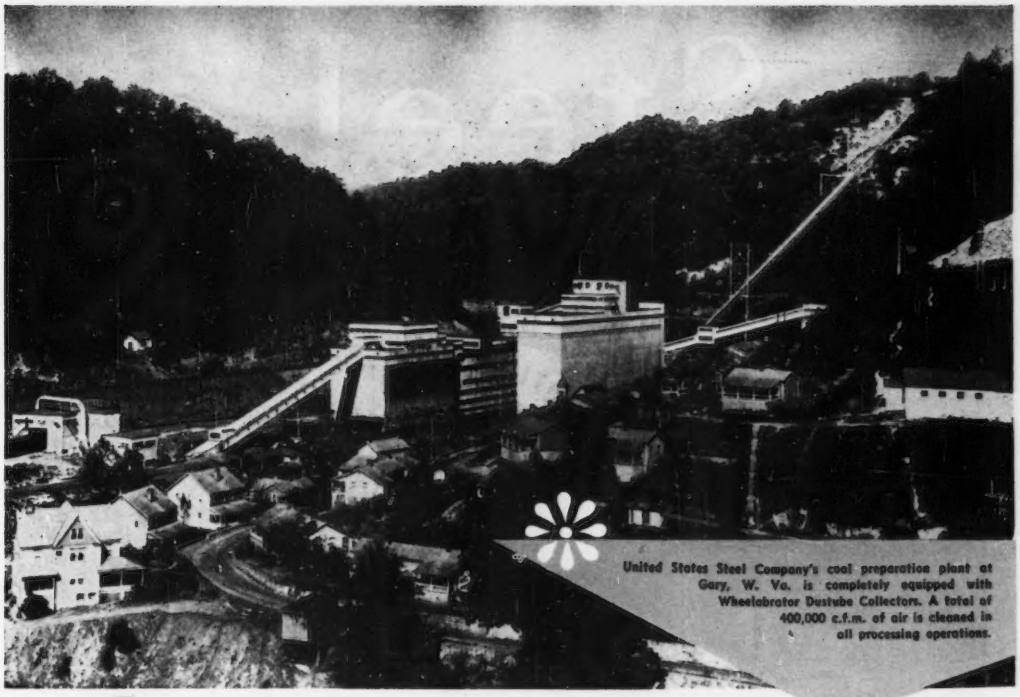
Extensive use of laboratory and pilot plant research is another important reason why Chemico plants are profitable investments.

CHEMICAL CONSTRUCTION CORPORATION
A UNIT OF AMERICAN CYANAMID COMPANY
488 MADISON AVENUE, NEW YORK 22, N. Y.
CABLES: CHEMICONST, NEW YORK
EUROPEAN TECHNICAL REPRESENTATIVE
CYANAMID PRODUCTS, LTD., NORTH WEST WING, BUSH HOUSE
ALDWYCH, LONDON W.C. 2, ENGLAND

CHEMICO CHEMICAL CONSTRUCTION CORP.

Chemico Plants are Profitable Investments

CC 623



United States Steel Company's coal preparation plant at Gary, W. Va. is completely equipped with Wheelabrator Dustube Collectors. A total of 400,000 c.f.m. of air is cleaned in all processing operations.

WHY Dustube® CLOTH FILTRATION OFFERS YOU THE MOST

in Dust and Fume Control

UNIFORM RECOVERIES APPROACHING 100% of the fume entering the Dustube cloth tube type collector are commonplace. Collected materials may be reprocessed without dewatering, filtering or drying.

HANDLES HOT AND/OR CORROSIVE GASES. A wide selection of filter fabrics, including new synthetics, has increased the scope of cloth filtration permitting the economical handling of hot and/or corrosive gases. The Dustube will pay dividends in operating economies when installed for the recovery of values in gases from roasters, sintering machines, induction furnaces, gold and silver refining operations, etc.

RUGGED SIMPLICITY, ECONOMICAL OPERATION. Dustubes have the inherent capacity for continuous, severe service at high filtration efficiency with a minimum of down time for maintenance. Heavy duty construction is *standard* for the Dustube.

APPLICATION ENGINEERED. Every Dustube job for the mining and metallurgical industry is individually designed. Dustube Collectors can be designed for existing or new plant buildings, and flue lines. Various arrangements of hoppers and hopper discharge mechanisms are available.

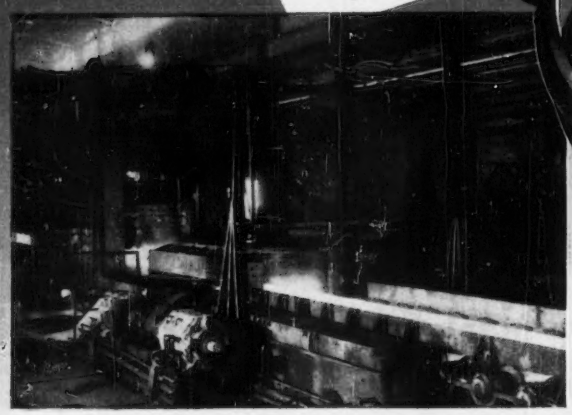
Our engineers are at your service to assist you in your filtration problems. It will pay you to investigate the many advantages of Dustube Collectors. *Write for complete information today.*

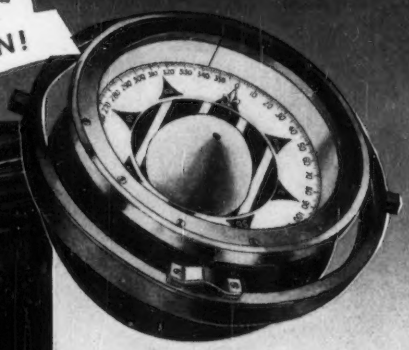
American dustube COLLECTORS

Steel

BULWARK OF FREEDOM, AND . . .

NAVIGATOR OF INDUSTRIAL MIGRATION!





BLOOMING THE INGOTS

Steel, like dough for bread, must be kneaded, rolled and worked from ingots weighing several tons down to many shapes and sizes. First in the series of such processes is the giant blooming mill of which Sheffield has installed the most modern type.

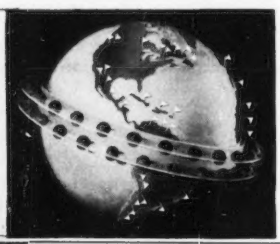
SINCE Colonial times industry has been on the move, migrating from the Northeast—West, Southwest—with iron and steel providing the means and in many cases, the motive.

West of the Mississippi and East of the Rockies, Sheffield Steel and its forebearer have successfully navigated the uncharted course of steel production since 1888. First, and still the only fully integrated steel mill operation in Mid-America, Sheffield continues to devote an ever-expanding production to a wide diversity of the particular kinds of steel products most needed in the industrial growth of the region.

Within the last ten years, the industrial growth of the region has shattered all records. So, too, has Sheffield Steel in expanding some of its facilities as much as 3½ times, and marking up an overall capacity increase, at its three plants, of over 100% as compared to 25% for the steel industry as a whole.

SHEFFIELD STEEL CORPORATION
HOUSTON KANSAS CITY TULSA
SUBSIDIARY OF ARMCO STEEL CORPORATION

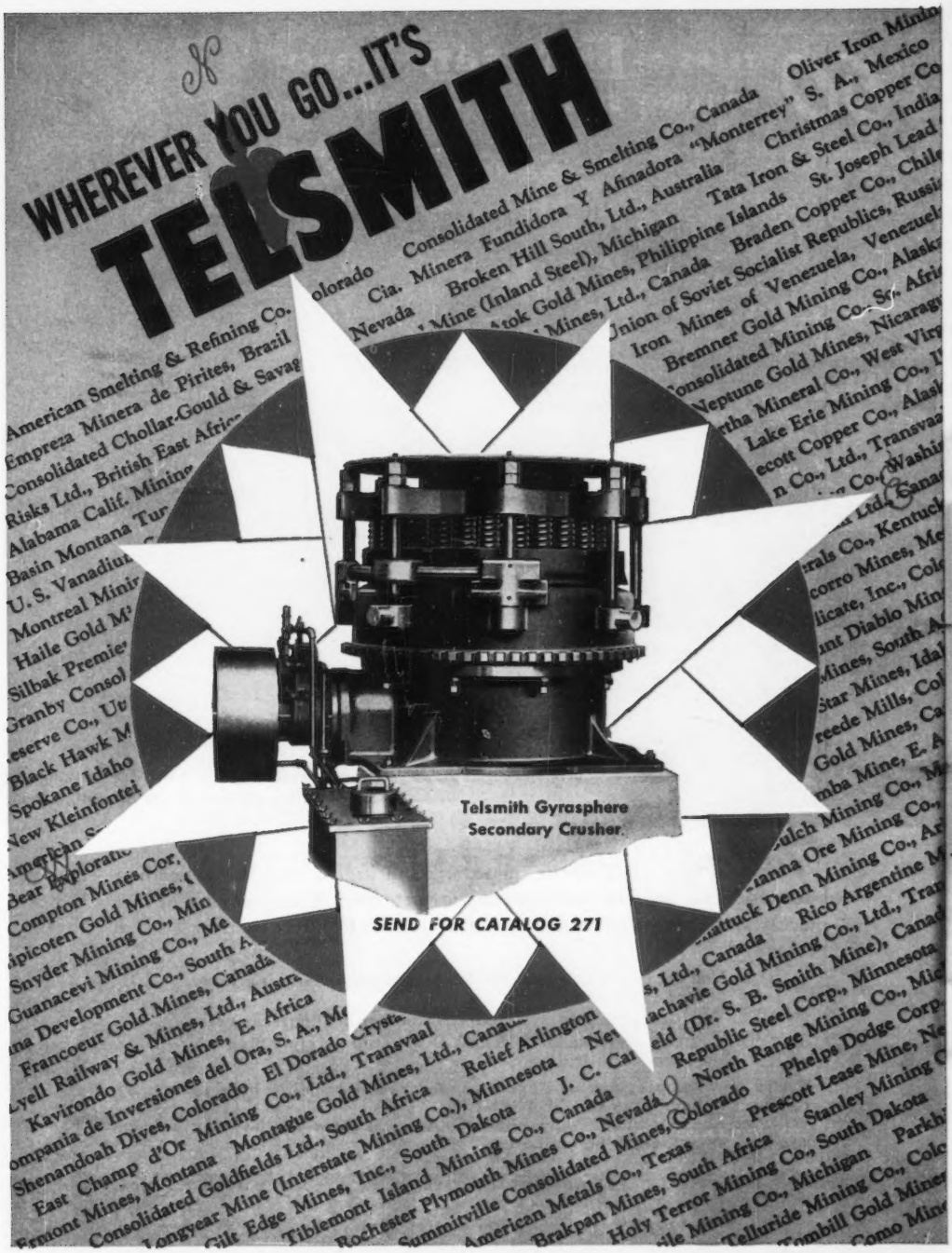
SHEFFIELD MOLY-COP
COPPER-MOLYBDENUM ALLOY
Grinding Balls
USED and PROVED ALL AROUND THE WORLD



IRON AND STEEL *SCRAP* MEANS . . . . . .

MORE STEEL FOR AMERICA
More Money In Your Pocket!

GET YOURS OFF TO THE DEFENSE LINES NOW!



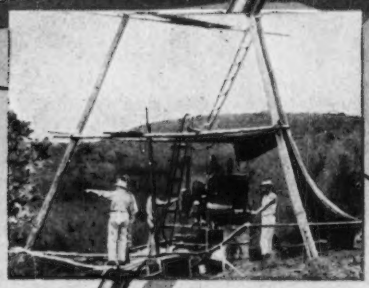
SMITH ENGINEERING WORKS, 502 EAST CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Address: Sengworks, Milwaukee

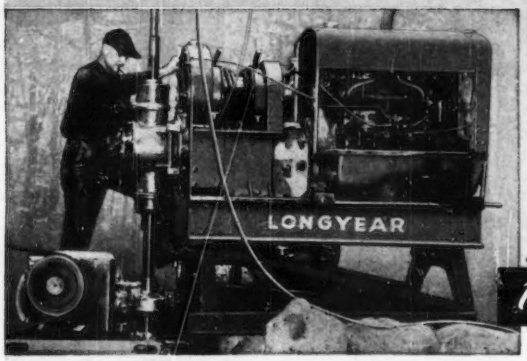
Samuel Osborn (S. A.) Ltd., Johannesburg, So. Africa • Armco International Corp., Buenos Aires, Argentina
51 East 42nd St., New York 17, N. Y. | 211 W. Wacker Dr., Chicago 6, Ill. | Mine & Smelter Supply Co., Denver 17, Colo. | Mines Eng. & Eqpt. Co., San Francisco 4, Calif.
Ontario Eqpt. & Supply Ltd., Toronto, Canada • Mussens Canada Ltd., Montreal, P.Q. • Gordon Russell, Ltd., Vancouver, B. C.

60 YEARS OF Longyear CONTRACT DRILLING SERVICE . . . 'round the world

1890... E. J. Longyear drilling first diamond drill hole on Mesabi Iron Range.



Longyear contract drilling crew in Venezuela.



1950.. exploring for iron ore in Canada with a Longyear UG Straitline Drill.

Today... There is immediate and urgent need for expanding known mineral deposits and exploring for new ones. Your goals can be met quickly and economically by using LONGYEAR Contract Drilling Service because . . .

1. You get dependable samples. Without them, drilling is a waste of time and money.
2. You get experienced crews trained in modern drilling techniques.
3. You get up-to-date LONGYEAR Drills assuring rapid progress and economical drilling.

- **Speed up *your* program of surface, underground or blast hole drilling by contracting your work to LONGYEAR.**
  Write us about *your* drilling problems...we will show you how our service can help you. There is no obligation.

E. J. LONGYEAR COMPANY

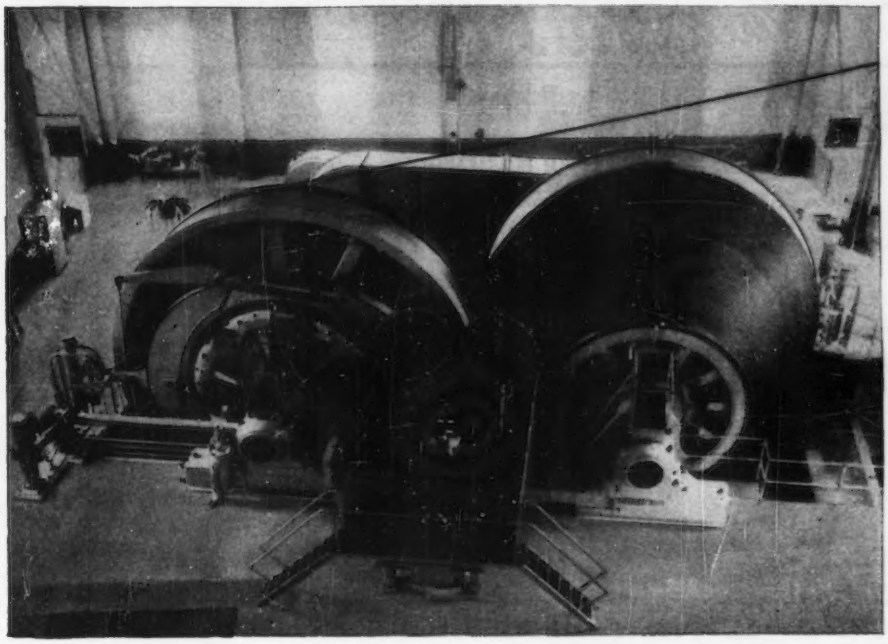
MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE, 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES.

WIRE ROPE



For shaft, incline and haulage service specify Roebling

WHEREVER WIRE ROPE is subjected to excessive abrasion or bending and acceleration stresses . . . to heavy loads and high speeds . . . the proper Roebling Preformed "Blue Center" Steel Wire Rope will last longer and save money. "Blue Center" steel is an exclusive Roebling development that assures real toughness. Roebling Preformed also adds extra handling ease and smooth performance.

Roebling makes a full line of wire rope. Have your Roebling Field Man recommend the ones that will meet your needs with top efficiency and economy. And for biggest savings, get his advice on the correct use and maintenance of wire rope. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

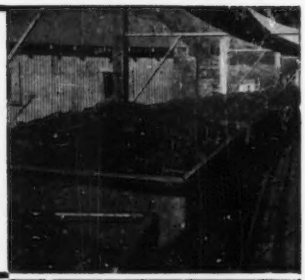
THE S-D "FLOATER"...

America's No. 1 Mine Car Wheel!

"FLOATERS"

FOR FASTER . . . CHEAPER HAULING

Independent engineering firm tests prove that locomotives can pull up to 50% greater loads with no additional power requirement when cars are equipped with S-D "Floaters" instead of other types of precision bearing wheels . . . a big power and time saver!



"FLOATERS"

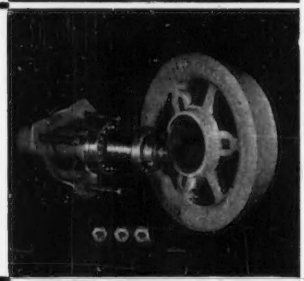
FOR LESS MAINTENANCE . . .

With "Floater's" solid closed front hub, and back double seal, grease stays in the wheel, dust and dirt stay out. Often "Floaters" require greasing no more than once in five years.

"FLOATERS"

FOR QUICK DEMOUNTABILITY

Any unskilled worker can remove and replace a "Floater" as easily as changing an automobile wheel. Bearings always remain in perfect adjustment on axle. When replaced there's no chance of pinching, misalignment, loose or tight bearings.



"FLOATERS"

FOR LONGER WHEEL LIFE

We believe our own special mixture of iron and exclusive heat treatment are responsible for making "Floaters" famous for their toughness and long wear . . . such quality is your assurance of perfect satisfaction.

Try S-D "Floaters". Check their savings. Experience proves that once an operator knows what "Floaters" will do for him, he specifies smooth-running "Floaters" for all wheel replacements. For complete information, write Sanford-Day Iron Works, Knoxville, Tenn.

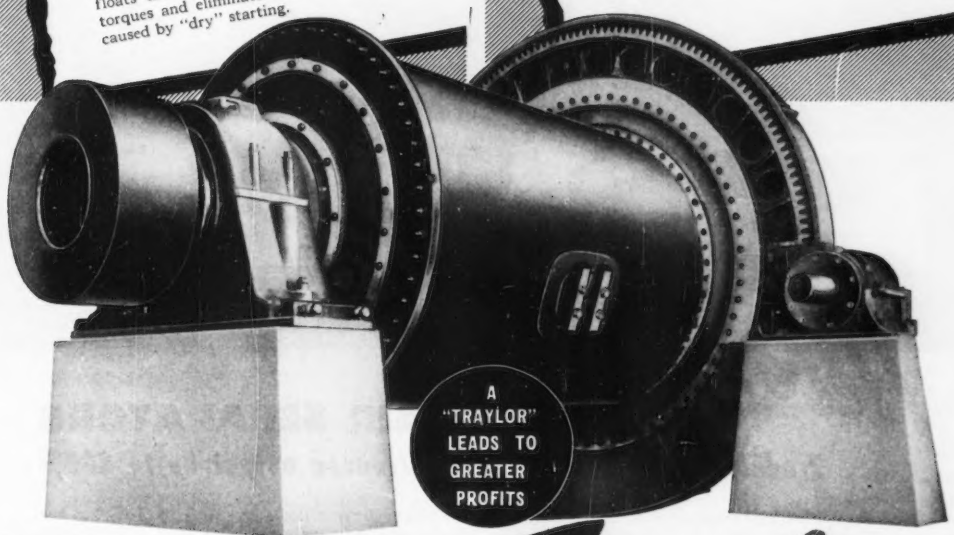
SANFORD-DAY IRON WORKS

Here's why a Traylor Ball Mill

needs less maintenance

HEADS are cast steel . . . faced and counter bored to fit shell flanges. Shell is of all welded steel plate construction with heavy flanges welded to each end. Flanges are faced and turned to insure proper alignment with heads. Trunnions are cast integral with the heads, *turned* and *highly polished*. Large trunnion bearings . . . of heavy ball and socket design . . . are continuously lubricated by an internal oil elevator. To save power and reduce bearing wear when starting the mill, a high pressure Alemite pump is fitted to each bearing. This pump coats the trunnion with a film of grease which lifts and floats the mill to overcome high starting torques and eliminate undue bearing wear caused by "dry" starting.

GEARS are important to ball mill operating and maintenance costs. Traylor gears mesh smoothly . . . are less subject to wear . . . minimize power waste. The main gear is furnished in halves. Both this steel main gear and the steel pinion gear are reversible. Using *both sides* of the teeth greatly lengthens gear life. The teeth are generated involute with *high* addendum on the pinion . . . low addendum on the main gear . . . on a Maag Type Automatic Gear Generator. This has been *standard* practice at Traylor for over 25 years.

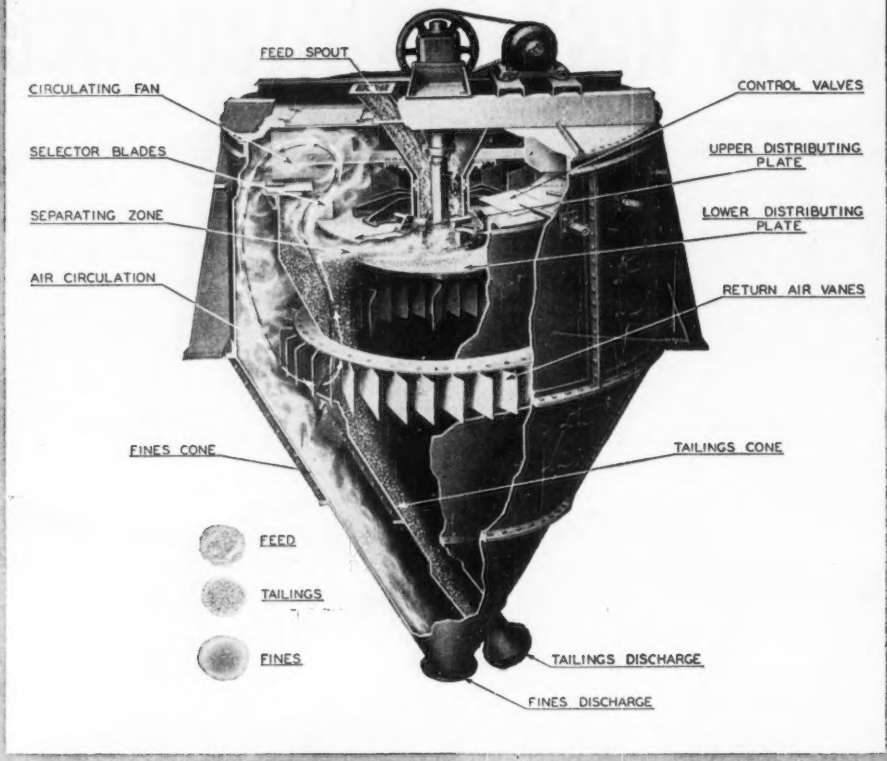


As your production rate climbs...your need for a Traylor Ball Mill will grow. As your grinding costs increase, so will your need for *more productive* equipment to protect your profits. Traylor Mills are built for *continuous operation...for dependable 24 hour production* with a *minimum* of down time for maintenance. Write today if you have a grinding problem due to increased production requirements. Traylor can show you how to put your grinding operation on a *profitable* 24 hour basis.

Traylor

Rotary Kilns, Coolers and Dryers • Grinding Mills
Jaw, Reduction and Gyratory Crushers • Crushing Rolls

TRAYLOR ENGINEERING & MANUFACTURING CO.
414 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York, N.Y., Chicago, Ill., Los Angeles, Calif.
CANADIAN MFR., Canadian Vickers, Ltd., Montreal, P.Q.



Here's How—

STURTEVANT AIR SEPARATORS

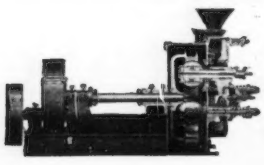
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

STURTEVANT
MILL COMPANY
101-A *Clayton Street, Boston 22, Massachusetts*
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

9 reasons why reliable REDSHOT is the choice of the blasting crew

Made to the specifications of the explosives engineer... that's Hazard Redshot. Precision manufactured for mining operations, only Redshot can offer you these 9 important advantages:

- Extra flexible for easy coiling and uncoiling
- Bright red for added visibility
- Tough Hazaprene insulation and sheath for rugged service
- Highly flame-resistant in accordance with requirements of U.S. Bureau of Mines and Pennsylvania Dept. of Mines
- Parallel conductors to reduce conductor resistance and prevent kinking
- Insulation grooved for easy separation at connections
- No fibrous fillers to absorb and retain moisture
- Uniform insulating wall prevents shorting between conductors
- Insulation is free-stripping for clean, easy splicing

Examine Hazard Redshot Type RG Shot Firing Cord ... mail the coupon for your free sample. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZARD INSULATED WIRE WORKS
Wilkes-Barre, Pa.

Gentlemen:

Please send me a free sample of the new Hazard Redshot Type RG Shot Firing Cord.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

HAZARD insulated wires and cables for every mining use

NOW—Simpler, Faster, Automatic Titrations!

The BECKMAN Automatic TITRATOR

Here's another new Beckman advancement in instrumentation—*an instrument that runs your titrations for you.* It's the Beckman Automatic Titrator—the instrument that makes accurate titrations more rapidly and conveniently than by manual methods.

SIMPLE OPERATION: In a series of titrations, simply fill the burette, place the sample in the beaker—and the Beckman Automatic Titrator takes over from there. Raising the beaker holder into position automatically starts the stirrer motor and begins delivering titrating solution into the sample.

A special circuit electrically anticipates the approaching end point, scaling down delivery of the titrating solution in progressively smaller increments to assure a highly accurate titration. When the end point is reached, delivery of the titrating solution stops and a light shows completion of the titration—*all automatically and without attention from the operator.*

Whether your laboratory is large or small the Beckman Automatic Titrator provides important advantages in your titrating operations...

- *It releases the technician during titration, enabling him to perform other operations such as preparing samples, or calculating results.*
- *It eliminates the fatigue caused by close observation required in manual procedures.*
- *It gives objective, reproducible results... eliminates errors due to personal factors.*
- *It provides time-saving conveniences for sample handling.*

PERFORMS A WIDE VARIETY OF TITRATIONS—**Neutralization, Oxidation-Reduction, Precipitation, Complex-Formation and other types.**

NO SPECIAL TRAINING IS REQUIRED—rapid and accurate titrations can readily be performed without special skill or technique.

QUICK, SIMPLE OPERATION—completes many routine titrations in only 1-1½ minutes—even titrations to 0.1% accuracy in 2½ minutes or less. Change of sample is simple, rapid—a single motion raises, locates and secures new sample in operating position.

CONVENIENT, VERSATILE, ADAPTABLE—0° to 100° C temperature compensation . . . adjustable holder accommodates 10 ml to 400 ml beakers or similar vessels . . . instrument may be used with all standard burettes down to 5 ml . . . as many as four delivery units accommodated by single amplifier control unit . . . . uses standard Beckman electrodes . . . electrode holders and delivery tip can be pivoted into any required position . . . ample provision for mounting heating devices or other special equipment.

ALSO A RELIABLE pH METER—the Beckman Automatic Titrator can also be used as an AC-powered pH meter to give accurate readings over the range 0 to 14 pH, as well as millivolt readings from −600 to +1400 mv.

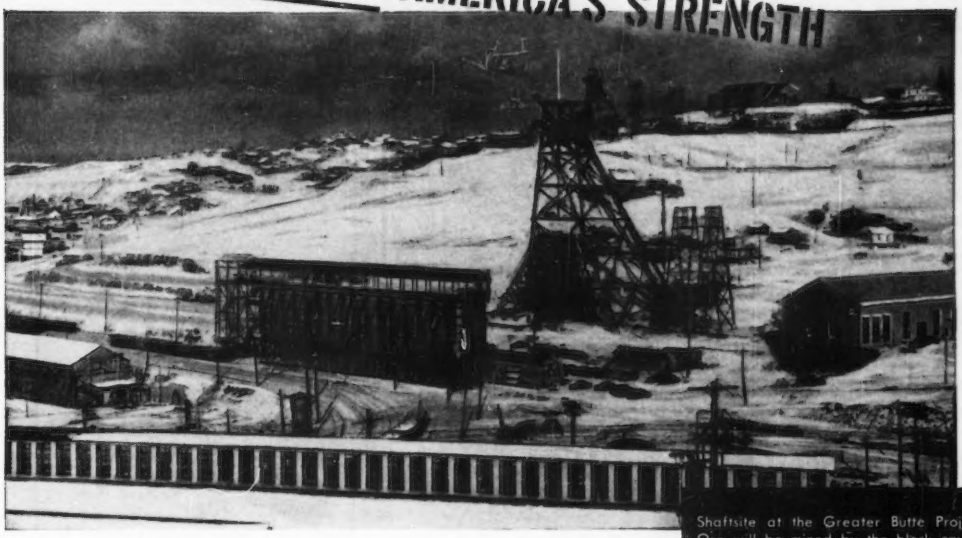
For full details on this new Beckman instrument see your authorized Beckman dealer—or write direct, *Beckman Instruments, South Pasadena 27, California*

Factory Service Branches:
NEW YORK — CHICAGO — LOS ANGELES

BECKMAN INSTRUMENTS
control modern industries

Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

AN UNDERGROUND MOVEMENT THAT INCREASES AMERICA'S STRENGTH



Shaftsite at the Greater Butte Project. Ore will be mined by the block-caving method. The shaft is now 1361 feet deep; will be one of the world's largest when completed. Headframe (center) is 178 feet high. Ore bins are at left; hoist house at right.

Not all that's red is America's enemy.

We have no mightier ally in our mobilization effort than that versatile red metal—copper.

The Greater Butte Project, pictured here, was begun by Anaconda in 1948. It will start delivering copper ore of low grade early in 1952 at the rate of 6,000 tons a day. Eventual output is expected to reach 15,000 tons a day, resulting in an increased copper production of 90,000,000 pounds a year. This is in addition to continued output of copper, zinc and manganese ores from existing underground mines.

This giant Montana project . . . but one phase in Anaconda's tremendous expansion, improvement and modernization program . . . will cost some $27,000,000. Every dollar is a sound investment in America's defense today—in America's progress and prosperity tomorrow.

For copper, indispensable to military needs, is equally indispensable in time of peace. Wherever people live or work or play, you'll find copper doing more jobs and doing them better than any other metal. And when, in a more stable world, comfort and convenience are again the first consideration, no metal will do more than copper in helping to achieve them. 51324A

ANACONDA®

First in Copper, Brass and Bronze

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

Reproduced from "De Re Metallica," translated by Herbert Hoover, through permission of Dover Publications, Inc.

"A miner understands that a forked stick is of no use to him"

What Georgius Agricola said over 400 years ago still holds true. Enchanted twigs, and other magic "instruments" are of no use in locating minerals.

Today geologists count on instruments that produce dependable facts. They depend on the Gulf airborne magnetometer—the fastest, most economical tool yet developed for mineral exploration.

They know that in the hands of AERO mappers, the airborne magnetometer has helped geologists uncover important finds of iron, nickel, chrome and asbestos—often at a cost of a few cents per acre. AERO's maps are dependable because the Gulf instrument's response is rapid and complete, with no attenuation or rounding off of complex magnetic figures.

AERO has nearly a half-million miles of experience in Canada, the United States, South America and Africa to bring to your conference table.

AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

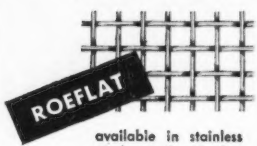
TOPOGRAPHIC MAPS • PLANIMETRIC MAPS • PRECISE AERIAL MOSAICS
AIRBORNE MAGNETOMETER SURVEYS • RELIEF MODELS • COLOR PHOTOGRAPHY

AGGREGATE WIRE SCREENS

Roebling offers the right metal or alloy for extra economy

made of Abraso... high carbon steel wire

made of Roetemp... oil-tempered steel wire



available in stainless steel, monel and other alloys

WHETHER ROEBLING ROEFLAT or some other construction best meets your screening requirements, Roebling goes a long step farther... offers you each and every construction in the exact metal or alloy to bring maximum screen life and economy in your operations.

As one example, the vastly increased working life afforded by Roebling Roeflat's unique construction can be boosted still further by adopting Abraso, for its high resistance to vibration fatigue; Roetemp, for abrasion and fatigue resistance; stainless steel, monel or other alloys to overcome corrosion problems.

Get the whole Roebling Aggregate Screens story... write for Catalog W-903.

WOVEN WIRE FABRICS DIVISION
John A. Roebling's Sons Company
Roebling, New Jersey

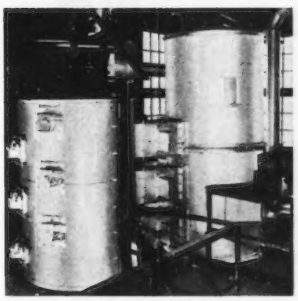
Woven Wire Fabrics Division
John A. Roebling's Sons Co., Roebling, N. J.
Gentlemen: Please send me free copy of Catalog W-903 giving up-to-the-minute information about Aggregate Screens.
Name.....
Company.....
Address.....
City.....State.....

ROEBLING

Nichols . . Laboratory and Pilot Plant Equipment

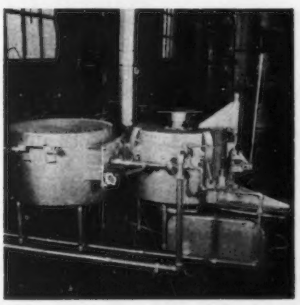
For the industrial or institutional laboratory requiring pilot plant facilities, Nichols Engineering services and several pilot plant size units are available, such as those for thermal processing, spray drying and classifying.

We are prepared to process materials in our laboratory and to design and supply equipment for installation in our clients laboratories. An experienced technical staff is available for operation.



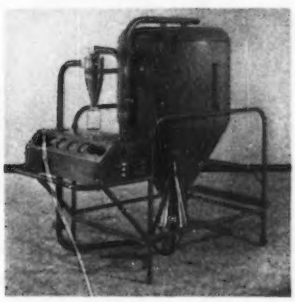
36" Nichols Herreshoff Multiple Hearth Furnace

For investigations involving quantities of material up to about 250 lbs. per hour under conditions of continuous feed and discharge at temperatures up to 1800-1900°F. Heat supply by oil, fired in an extraneous combustion chamber. Hot combustion gases removed through breechings and outlets located at several hearths, with means for re-introduction if required. Capable of operation under either natural or induced draft.



18" Herreshoffing Unit →

For small-scale batch tests, up to 30 lbs., prior to advancement toward a more comprehensive program.

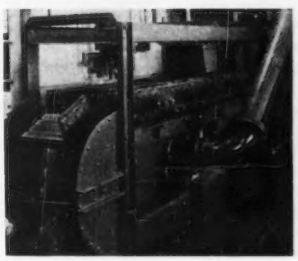


Portable Nerco-Niro Spray Dryer ←

Hot air supply by an electric heater or by mixing with hot combustion products from a gas burner. Capable of atomizer speeds up to 50,000 R.P.M. and temperatures to 575°F. For laboratories or small scale pilot plants.

12" x 48" DWIGHT-LLOYD Sintering Machine ↓

A pilot-size DWIGHT-LLOYD Sintering Machine for sintering small lots of materials and for test work in connection with the design of sintering plants. Capacity up to approximately 600 lbs. per hour.



1½" Vortrap Classifier ←.

For removing solids from slurries. 25 G.P.M. capacity.

Your inquiries are invited. Write us for further information.

Nichols Engineering & Research Corp.

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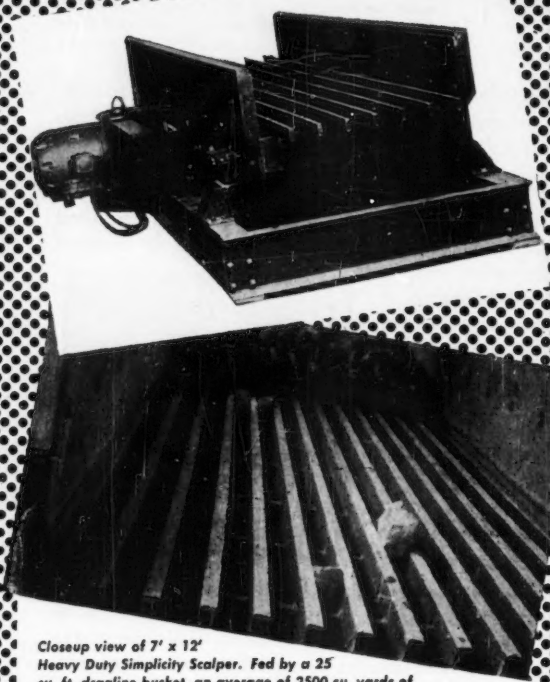
1477 Sherbrooke St. W., Montreal 25, Canada

when the going is rocky
you can rely on SIMPLICITY SCALPERS



Closeup view of 7' x 12' Heavy Duty Simplicity Scalper. Fed by a 25 cu. ft. dragline bucket, an average of 2500 cu. yards of material passes through the 5" opening between the riding rails each hour. Approximately 250 cubic yards of boulders are scalped off the top.

Scalpers have to be tough to take the steady pounding of heavy impact loads . . . and that's the reason why Simplicity heavy duty scalpers are first choice when the going is rocky. For Simplicitys are tough, dependable and versatile. They not only handle straight scalping operations but can be used to feed crushers, handle rip-rap, and can also be equipped with a second deck for dirt removal. Simplicity Scalpers can be supplied with special rail type deck construction or perforated plate with or without rails. Simplicity units, built in sizes 3' x 8' to 7' x 12', will give you dependable, trouble-free operation . . . why not get the full story today. A Simplicity sales engineer will be glad to give you all the facts.

Simplicity
TRADE MARK REGISTERED

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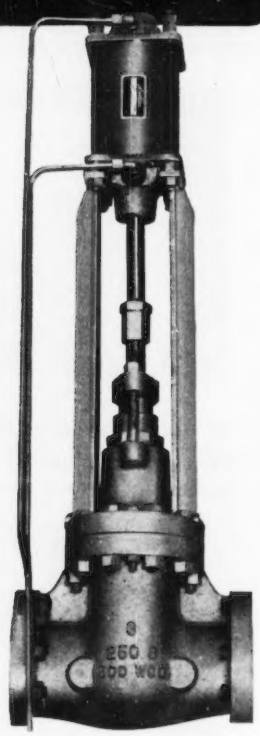
Ledeen
VALVE ACTUATORS



For Power Operation of All Types of Valves

Ledeen Valve Actuators are particularly adaptable for labor saving, or remote control of inaccessible valves. They can be adapted to any make, size, and type of valve to operate against any line pressure—for any fluid medium—with any pressure. Can be arranged for on-and-off, or positioning service. Positive in action, economical in cost

Write for Bulletin 512

Ledeen Mfg. Co.
1606 San Pedro
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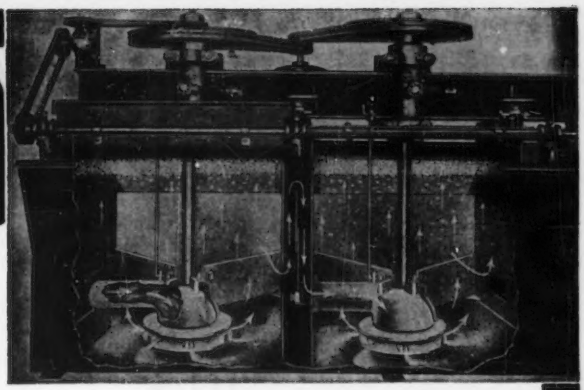
USE "JETAIR" FLOTATION FOR



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- IMPROVED RECOVERY of mineral
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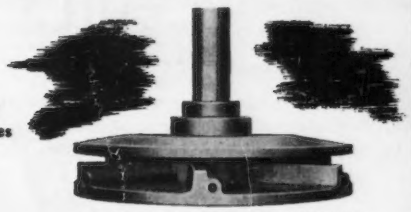
- POSITIVE AIR CONTROL

Supplied with or without individual cell pulp level control



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with the 1½" x 1½ HP

NEW TIW

Vertical Centrifugal

SAND PUMP

HIGH EFFICIENCY
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LOW INITIAL COST
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COMPACT AND LIGHT WEIGHT

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THE TELLURIDE IRON WORKS CO.

P. O. BOX 560

400 Main Avenue, Durango, Colo.

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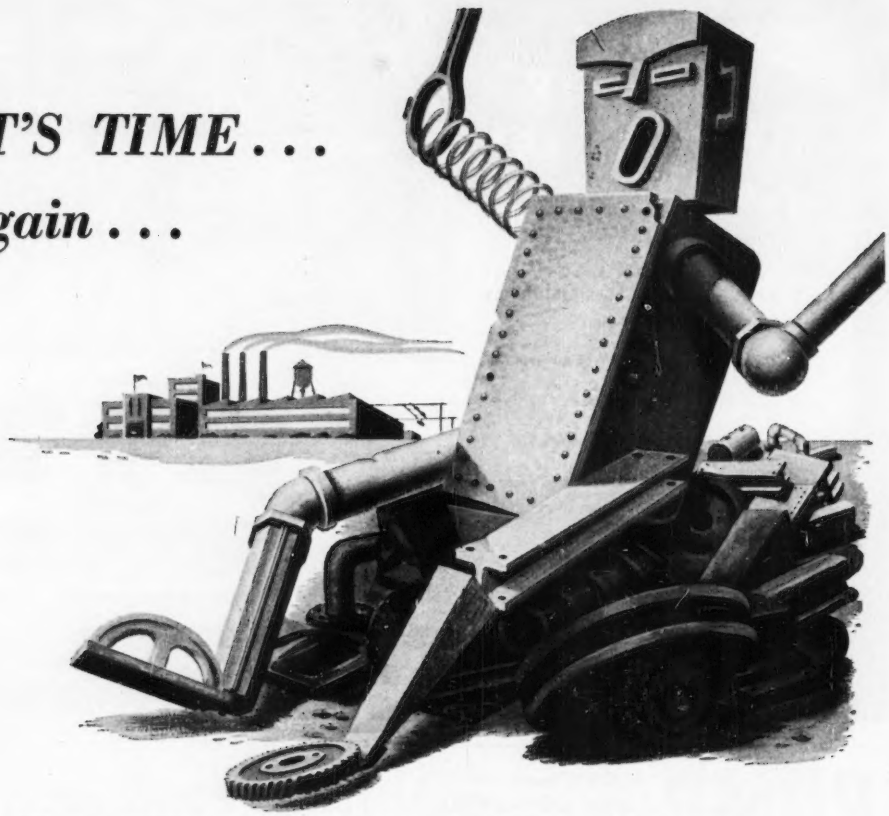
. . . with WHITCOMB LOCOMOTIVES operating problems are cut effectively.

THE WHITCOMB LOCOMOTIVE CO., ROCHELLE, ILLINOIS

Subsidiary Baldwin-Lima-Hamilton Corporation

IT'S TIME . . .

again . . .



TO WAKE UP SCRAPPY!

Scrap's getting scarce again . . . compared to the amounts we need . . . and it's up to *all* of us to *help* produce enough steel.

107,000,000 tons of steel is the present rate of production in 1951 . . . 119,500,000 tons is expected in 1952.

Last year, 1950, we produced 97,800,000 tons.

All that extra steel—enough to take care of *both* military and civilian needs—calls for *more scrap iron and steel.*

Scrap Inventories Are Alarmingly Low

While steel mills are producing at a greater rate than ever, scrap inventories have dwindled. Many mills are operating on a hand-to-mouth basis with shut-downs threatened unless we furnish more scrap.

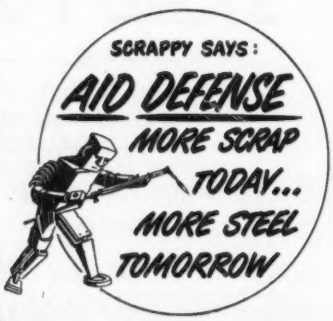
We *do* have the scrap. It's everywhere, not just in the form of *production* scrap—the "leavings" of machining, normally turned over to scrap dealers . . . but also in the form of *idle* metal: obsolete machines and tools, no-longer-usable jigs and fixtures, gears, chains, pulleys, valves, pipe, abandoned steel structures, etc.

We must have this *idle* metal to keep the furnaces running.

Please cooperate. Set up a Scrap Salvage Program in your plant—*now.* For a complete plan on "how to do it", write for booklet "Top Management: Your Program for Emergency Scrap Recovery". Address Advertising Council, 25 W. 45 Street, New York 19, N. Y.

Why Do We Need *Scrap?*

Steel is made half from pig iron, half from scrap. With production on the increase, more scrap must be purchased. And it's up to you to "dig it out" and sell it.



NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

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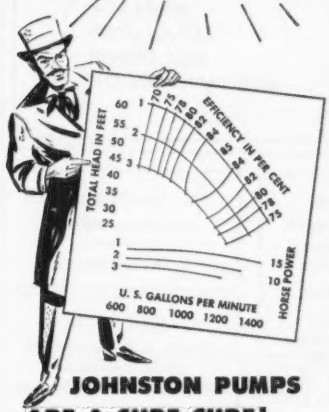
Suffering from
Horsepower Headaches?



JOHNSTON PUMPS ARE A SURE CURE!

Don't blow a fuse because you are overloaded with pumping troubles. The steep head-capacity and flat horsepower characteristics of Johnston Vertical Turbine Pumps prevent overloading of the motor regardless of fluctuations in capacity or head. Low starting torque requires less horsepower and results in higher efficiency and longer life of the motor.

The Treatment Is Painless

Every Johnston Pump is engineered for the specific duty for which it is intended. Trained hydraulic engineers are available at your nearest Johnston dealer or at the Johnston factory to furnish detailed information, proposals and anything else necessary to cure your particular pumping malady.

The Johnston Wonder Drug

Johnston Turbine Pumps are ideally suited for industrial and municipal applications because of their non-overloading characteristics, simplicity of construction, compactness, ease of installation, elimination of priming, low starting torque, capacity adjustment features and minimum maintenance costs.

Free diagnosis!

No matter what your pumping job, contact your nearby Johnston Dealer or write the factory direct for a free diagnosis of your pumping headaches.

JOHNSTON PUMP COMPANY
3272 EAST FOOTHILL BLVD., PASADENA 8, CALIF.
Headquarters for Vertical Turbine, Mixflow and Propeller Pumps Since 1909

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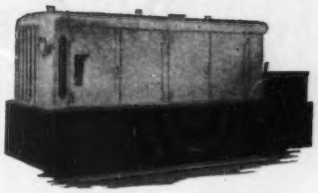
A 7-Ton, Mine Type Locomotive of 18" Gauge, 60" Overall Height from top of rails; equipped with Caterpillar D-311 Engine. Water Wash Muffler and Exhaust Diffusor; Twin-Disc Hydraulic Coupling; 4 Speed Transmission both Forward and Reverse. Can be provided Explosion Proof where desired.



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DRIVE

In the selection of a locomotive as to size and type, it is important to meet the particular requirements of the conditions under which it is to operate—and the work to be done. If the unit is too large, valuable power is lost; if too small, precious time is lost.

Let Us* ANALYZE *Your Needs

We would regard it as a privilege to analyze your haulage needs and to recommend a locomotive FITTED to those needs. All without obligation on your part.

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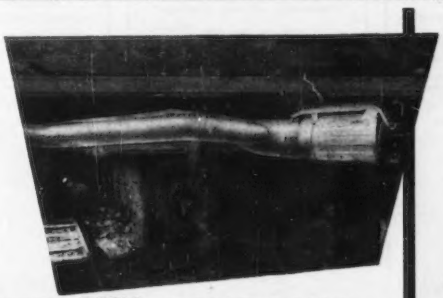
EXPORT OFFICE • 50 CHURCH STREET, NEW YORK 7 • CABLE ADDRESS "BROSITES"



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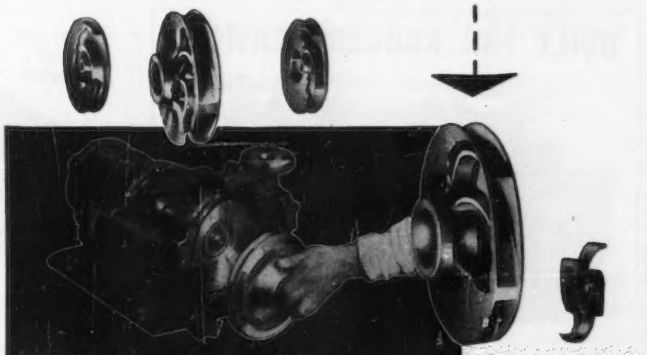

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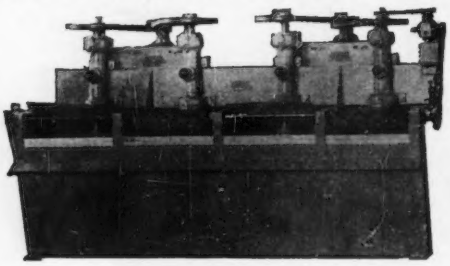

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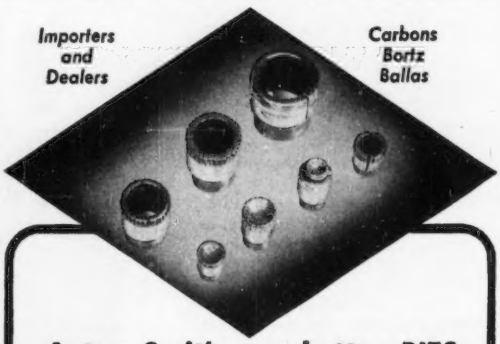

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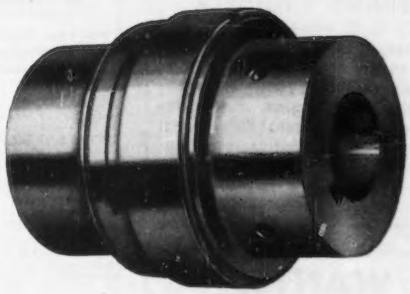

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P7942, Engineering & Mining Journal
330 West 42nd St., New York 18

WANTED
MINING ENGINEER

Age 25 to 35 years, to assist chief engineer, should have experience mine surveying with knowledge of drafting, surface plant and construction. Salary open. Please enclose complete personal data, recent photo, details education, etc. Location: Caribbean.

P2601 Engineering & Mining Journal
330 W. 42nd St., New York 18, N.Y.

WANTED
ASSISTANT MINE SUPERINTENDENT

Age 30 to 40 years, for underground metal mine. Must have had previous underground experience in cut and fill, square set stopes and mechanical slushing. Enclose recent photo, full details experience, education. Salary open. Location: Caribbean.

P2600 Engineering & Mining Journal
330 W. 42nd St., New York 18, N.Y.

REPLIES (Box No.): Address to office nearest you
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CHICAGO: 520 N. Michigan Ave. (11)
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ASSISTANT HYDRAULIC Engineer with some field experience in construction of hydro-electric power plant projects, etc. for large Copper Company, Chile, South America. Civil Engineering graduate preferred. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-2571, Engineering & M Jl.

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MINING ENGINEER: Age 25 to 35 years, to assist Chief engineer. Should have experience mine surveying with knowledge of drafting, surface plant and construction. Salary open. Please enclose complete personal data, recent photo, details education, etc. Location: Caribbean. P-2617, Engineering & M Jl.

ASSISTANT MINE Superintendent: Age 30 to 40 years for underground metal mine. Must have had previous underground experience in cut and fill, square set stopes and mechanical slushing. Enclose recent photo, full details experience, education. Salary open. Location: Caribbean. P-2620, Engineering & M Jl.

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At present employed, but available on reasonable notice.

PW 1867 Engineering & Mining Journal
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MINING ENGINEER, 44, married, 2 children. Good health. 20 years experience underground operation. Good record for production, safety and labor problems. Presently employed. Available reasonable. PW-2449, Engineering & M Jl.

MINING ENGINEER, 39, fifteen years experience U.S. and S. Am. in underground, open pit, crushing, screening and processing, desires position as Plant or Mine Manager, Engineer or Supt. PW-2584, Engineering & M Jl.

MINING GEOLOGIST, 32, MS degree—four years experience with large corporation in open pit and underground geology, examinations, exploration and development programs—Married. Available December 1st. PW-2169, Engineering & M Jl.

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Rainbow Quicksilver Mine,
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BO 2512, Engineering & Mining Journal
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November 21, 1951.
DIVIDEND NO. 174

The Board of Directors of Anaconda Copper Mining Company has declared a dividend of One Dollar and Twenty-five Cents ($1.25) per share on its capital stock of the par value of $50 per share, payable December 21, 1951, to stockholders of record at the close of business on December 1, 1951.

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420 acres mineral ground, Lead, Silver, Copper;

Timber, water, and transportation. Present ore to supply 100 ton mill.

Vast potential possibilities for a big mine. Send for complete data.

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Large engineering firm wishes to acquire several complete plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment whole or in part. Personnel retained where possible, strictest confidence. ***Box 1231, 1474 Broadway, New York 18, N.Y.***

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3 TONS PER MINUTE
Guaranteed 95% New

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GEORGE A. CARLSON, Pres.
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TUGGER HOISTS

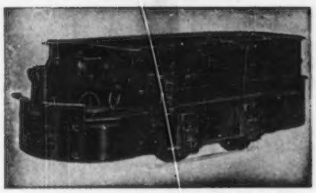
1—2 drum Ingersoll-Rand air tugger hoist, size KML-2G
1—Dillon-Box single drum air tugger hoist, model 3
2—Ingersoll-Rand single drum air tugger hoists, model GHC
1—Ingersoll-Rand 2 drum electric slusher hoist, size 5NN-01-1
1—Sullivan single drum electric tugger hoist, class RH
1—Ingersoll-Rand single drum electric tugger hoist, size 107
1—Ingersoll-Rand 3 drum electric tugger hoist, model 10NNN2G
1—Sullivan 2 drum electric slusher hoist, model B-211
1—Ingersoll-Rand new 3 drum electric slusher hoist, size 20-MNM-20
2—Sullivan single drum electric tugger hoists, D.C. type HE
9—Sullivan double drum electric tugger hoists, D.C. type HDE

FILTERS

1—4′ x 6′ Morse drum filter.
1—18″ Morse filter press.
1—36″ Merrill filter press.
1—#12 Sweetland filter press.

VIBRATING FEEDERS

1—10″ x 36″ Jeffrey type 2A
1—12″ x 30″ Jeffrey type 3
2—30″ x 42″ Jeffrey type FO #4
1—36″ x 36″ Jeffrey #4



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1—2½ ton Mancha battery locomotive "Titan A" 24″ ga. with 2 sets Edison batteries and charging set.
1—2-2½ ton Whitcomb battery, 24″ gauge
2—7 ton G.E. permissible type battery, 36 gauge
2— 8 ton G.E. battery, 36″ gauge
4—10 ton Atlas battery, 36″ gauge
1— 3 ton Whitcomb gas engine driven, 24″ gauge
1— 3 ton Ruth gas engine driven, 18″ gauge
1— 6 ton Goodman trolley, 36″ gauge

BALL & ROD MILLS

1—4′ x 4′ Standard ball mill.
1—8′ x 22″ Hardinge pebble mill.
2—3′ x 8′ Marcy rod mills.

LOADERS

2—12B Eimco rocker shovel loaders
1—#20 Eimco rocker shovel loader
2—#21 Eimco Rocker shovel loaders
4—#50A Conway muckers

COMPRESSORS

1—6″ x 5″ Worthington horizontal, 80 CFM.
1—6″ x 6″ Gardner vertical, 90 CFM.
1—8½″ & 4¾″ x 5″ Chicago-Pneumatic, 131 CFM.
1—7″ & 5¾″ x 5″ Gardner-Denver, 156 CFM.
1—12″ x 10″ Ingersoll-Rand, 179 CFM.
1—14″ & 9″ x 8″ Blaisdell, 213 CFM.
1—12″ & 6½″ x 10″ Ingersoll-Rand, 293 CFM.
1—14″ & 7½″ x 12″ Ingersoll-Rand, 447 CFM.
1—9¾″ & 6″ x 7″ Gardner-Denver, 527 CFM.
1—14″ & 8¾″ x 10″ Sullivan, 637 CFM.
1—16″ x 12″ Union, 698 CFM.
1—18″ & 11″ x 16″ Ingersoll-Rand, 800 CFM.
1—13″ x 10″ Laidlaw, 840 CFM.
1—24″ & 13″ x 16″ Ingersoll-Rand, 1418 CFM.
1—210 CFM Worthington "Blue Brute" portable compressor driven by Continental gas engine.
2—310 CFM Gardner-Denver portable compressors driven by Buda gas engines.

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1—1″ Wilfley sand pump
1—2″ Denver vertical sand pump
3—2″ Telluride sand pumps
1—2½″ Traylor sand pump
1—3″ Allen-Sherman-Hoff rubber lined hydro-seal
1—3″ Wilfley sand pump
1—3″ Telluride sand pump
1—4″ Allen-Sherman-Hoff hydro-seal
1—4″ Denver vertical sand pump
1—6″ Wilfley sand pump

JAW CRUSHERS

2—8″ x 12″ Universal 2M
1—9″ x 12″ Cedar Rapids
1—8″ x 24″ Rogers
1—8″ x 36″ Universal
1—9″ x 36″ Cedar Rapids
1—13″ x 24″ Telsmith
1—15″ x 28″ Pacific
1—8″ x 8″ Universal
1—9″ x 15″ Farrell

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Tube & Ball Mills—6′ x 9′—5′ x 22′—5½′ x 16′.
Fuller-Lehigh Mills—22″—47″ & 52″—Bradley Mills.
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Crushing Rolls—From 18″ x 12″ up to 72″ x 20″.
1—Complete Linel Hydrating Plant.
Sturtevant Rotary fine crushers—No. 0—No. 1—No. 1½ and No. 2.
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15′—16′ & 18′ Herreshoff furnaces.
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Magnetic separators—Jigs—screens—classifiers and thickeners.
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New Dryer and Kilns.

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Directorate-General, Supplies & Disposals, New Delhi, India, invites tender # SPI/2243B/IV on forms (not transferable) obtainable from India Supply Mission, 635 F Street N. W., Washington, D. C., at $4.20 (not refundable) per set for supply and erection of Construction Plant for Bhakra Dam and Appurtenant Works comprising:

1. Aggregate Processing Plant comprising Crushing, Screening, Log Washing Units, etc.
2. Aerial Ropeway System for transport of Raw Aggregate, Processed Aggregate, etc.
3. Batching and Mixing Plants.
4. Concrete Transport Equipment.
5. Placing of Concrete.

The tenderers should submit their proposals by January 15, 1952, stating the amount required, if any, by way of reimbursement of cost, in order to carry out necessary survey in the first instance and thereafter prepare the schemes suitable for site conditions.

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1—16' x 10' Dorr, Wood Tank, Steel Superstructure, complete with Motor and 2" Diaphragm Pump
3—Agitator Mechanisms, complete with steel "A" frames, ship type impellers, & V-belted to 20 HP Motors

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2—#24, 8-cell, Denver "Sub-A" — 43" x 43" cells — wood tanks, complete with motors & new rubber impellers.

CRUSHERS

1—9 x 40 Austin-Western Jaw Crusher
1—10 x 20 A. C. Blake Crusher

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1—#21½ Vulcan Sgl. Drum, with U-6 Gas Power Unit. Condition like new
1—15 HP Box I. Wks. Sgl. Drum with 15 HP Slip-ring Motor
1—#6½ Vulcan Hoist
1—7½ HP Hoist with Motor

MISCELLANEOUS

1—18" Belt Conveyor, 35' long, complete with motor and mechanism
1—Stromberg Metal Mine Phone
1—18" dia. x 26" Face Dings Mag. Pulley, 110 volts, with tail mechanism, drive & charger
1—Sullivan LW-6 Wagon Drill with Dry Drifter—on steel wheels
3—Gen. Eng. Wet Sample Cutters
1—2" Wilfley Sand Pump—rubber lined
1—50 HP Upright Boiler
1—32" x 16" F. M. Davis Crushing Roll
1—24" Denver Cone Reagent Feeder
1—30" x 48" Baker Ball Mill
1—50 Ton Truck Scale — 44' platform
25 Tons 85# Relayers
10 Tons 65# Relayers
3 Tons 16# Rail
Enclosed Safety Switches
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AIR SEPARATORS: One Sturtevant 8 ft. and one 10 ft., with extra heavy liners, condition like NEW, used only 6 months. One 4 ft. Whizzer with 5 H.P. motor and drive.
DRYERS or KILNS: 2—Allis Chalmers 10 ft. x 90 ft., heavy duty, plate thickness 22.95 lbs. per sq. ft., complete and with or without coal fired Furnace. Western Precipitation Dust Collector. Clarage #41 Exhauster. Motors, Control equipment, etc.
PULVERIZERS: Hardinge Mill size 5 ft. x 22", steel lined, complete with disc feeder and 30 H.P. motor. One Hardinge 10 ft. x 36", steel lined, complete with all equipment for dry grinding, with 300 H.P., 2300 volt, A.C. motor. One Sturtevant size 1½ Ring Roll Mill, NEW condition, large quantity new spare parts.
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COAL CRUSHER: Jeffrey Flexteeth size 24" x 42", power units on each, 3 phase, 60 cycle, 440 volt. steel frame, with or without Allis Chalmers, type ABZ, 75 H.P. motor, 3 phase, 60 cycle, 2300 volts.
CRUSHER, GYRATORY: Telsmith 13-B, all steel, opening 13 x 59, with 50 H.P., 440 volt motor, V-belt.
CRUSHERS, JAW: Various makes and sizes 12" x 15" to 48" x 60".
CRUSHERS, REDUCTION: 2—Newhouse 10" with 220/440 volt motors. 1—Symons 2 ft. with coarse bowl, without motor. 1—Symons 3 ft., short head, with fine bowl and one Traylor type TY, 2'4", with 9" opening; both with 75 H.P., 440 volt motors, V-belt drive.
LOG WASHER: 25 ft., heavy duty type with two legs, 6" x 6" x ¾" angles, complete, ready to operate.
BOOT BUCKET ELEVATORS: 1—Jeffrey vertical, continuous, full enclosed, buckets 8 x 5 on 278 Reliance chain, 70 ft. centers, NEW, UNUSED. 2—83 ft. ctr. manganese steel chain, buckets 16" wide.
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DRAG SCRAPERS: 1—Sauerman 2 yd. Drag Scraper outfit complete, without 75 H.P. motor. 1—Sauerman ¾ yd. capacity complete with 30 H.P. motor. 1—Sauerman 1½ yd. capacity complete with 60 H.P. motor.
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12 Diesel 100, 80, 65, 45, 30, 20 Ton Locomotives.
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100 Dump Cars, 2, 4, 12, 20 and 30 Yd.
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200, 400 & 700 HP—Double Drum Mine Hoists.
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16 lb. Rails—6500 lbs., with splice bars, bolts & spikes
Black Iron Pipe, 1000 ft., 2" dia.
Hand Shanking Device, 1-R-PSD Type
Jackleg Mountings, 1-R, 2
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Waterhoses, 20 ft. x 1", with couplings, 20
Carbide, ¾" x 1½", 30 drums @100 lbs.
Silicon Carbide Grinding Wheels, 8" x 1" x 5/8", flat face, 8
Round iron, 7/8" solid hex drill steel, wire nails, anvil, vise, wheelbarrows, hand tools, etc.

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Mining & Milling Machinery: Hoists, Compressor, Steel headframe & Ore Bin, Pumps, Rock Drills & Drill Rods:—Ball Mill, Concentrate Thickener & Filter Sand Pumps. Many Miscellaneous Items.

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One (1) used 350 HP 705 RPM
Slip Ring Induction Motor
and Magnetic Control
for Hoist Service—2300 V—3 Ph—60 Cy Primary.
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1 Deco Super Agitator "Wallace" Type No. 1RK8725 — 5 x 6 — good condition — spare propellers — no motor. F.O.B. Fredericksburg $500.00
1 Deco Sub A Flotation Machine No. 1-8085-1 — wood construction with steel countershaft frame — very good condition. F.O.B. Fredericksburg $3,000.00

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Qu	HP	Make	Type	Volts	RPM
1	400	G.E.	1K	2200	514
1	400	G.E.	KT-412	2300	435
2	300	Whse.	CS-890	2300	1780
2	200	Whse.	CS-871C	2200	1160
1	200	Al.Ch.	AR	440/220	580
2	125	Al.Ch.	AR	2200	1750
1	125	Whse.	CS-761C	440/220	1750
1	125	C.W.	126-Q	440/220	430
2	100	Whse.	CS-663C	440/220	1750
1	100	G.E.	1K	440/220	1800
1	100	Al.Ch.	AR	2200	1160
1	100	Al.Ch.	AR	550	690
1	100	F.M.	H241B	440/220	435
1	100	Whse.	CS-938	2200	695
1	78	G.E.	I-K15	440/220	570
1	75	Al.Ch.	AR	2200	1765
1	75	Al.Ch.	AR	2200	1750
1	75	Al.Ch.	AR	2200	690
1	50	G.E.	KT	440/220	1160

SYNCHRONOUS MOTORS—3-Ph., 60-Cy

Qu	HP	Make	PF	Volts	RPM
1	3000	Whse.	80	4800/2400	720
1	700	G.E.	80	2300	720
1	600	Whse.	80	2400	720
1	400	Whse.	80	440	600
1	300	Whse.	80	440	514
1	150	G.E.	100	2300	900
1	150	G.E.	100	550/2200	600
1	150	G.E.	80	550/2200	450
3	125	El.Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440/220	1800
1	100	Whse.	100	2200	1200
1	100	Ideal	80	220/440	900
2	100	G.E.	80	220/440	600

SLIP RING MOTORS—CONSTANT DUTY—3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1**	3000	G.E.	MT	2200	356
1**	1200	C.W	SR	2200	237
2**	1000	Al.Ch.	ANY	2200	235
1**	600	G.E.	MT-20	2300	360
1**	400	Al.Ch.	ANY	2200	514
2	300	G.E.	I-16-M	2300	450
2	600	G.E.	MT-412	2200	450
1	300	G.E.	I-15-M	2300	1200
1	300	Al.Ch.	ANY	2200	514
1	250	Al.Ch.	ANY	440	585
1	250	G.E.	MT-414	2200	300
1	200	G.E.	I-16-M	2200	585
1	150	G.F.	I-13-M	2200	1750
1***	125	Whse.	CW-870	2200	870
1	100	F.M.	H10C	440/220	900
1	75	G.E.	IM	440/220	695
1	75	Whse.	CW-7540	440/220	690

** Mill type pedestal bearing. *** 3 bearing.

MOTOR GENERATOR SETS

Qu	KW	Make	RPM	Volts DC	Volts AC
1	2400(3-U)	Al.Ch.	720	825	4800/2400
1	2400(3-U)	Whse.	720	600	4800/2400
1	1500	Whse.	514	250	4600/2300
1	1000	G.E.	514	550	2300
1	500	C.W.	720	250/275	2300/440
2	500	C.W.	720	575	2300/440
1	250	Whse.	1200	125/250	2300
1	200	Ridgway	900	275	2300
1	155	G.E.	720	250	2300/440
1	150	G.E.	1200	500	2300/440
1	100	C.W.	1200	125	440/220
1	100	Delco	1200	125/250	440/220
1	100	Ridgway	1200	275	4000/2300
1	85	C.W.	1900	250	2300/440
1	75	Stat	1200	230	440/220
1	75	Al.Ch.	900	250	2300
1	75	Whse.	900	75	2200
1	25	Ideal	1750	125	220
1	20	Al.Ch.	1200	250	440/220
2	15	Al.Ch.	1200	250	440/220
1	15	G.E.	1200	250	440/220
1	10	Whse.	1200	250	440/220

3-U — 3-unit set.

We can furnish any of the above sets with exciters and VARIABLE VOLTAGE CONTROL engineered and rebuilt for your requirements.

TRANSFORMER — Power

Qu	KVA	Make	Type	Phase	Voltage
1	3760	G.E.	DH	3	6900-240/480
3	500	Whse.	S	1	13800-2400
6	333	G.E.	H	1	13200/11000-2200
3	250	Packard	A	1	13200-2200
3	150	G.E.	H	1	19000/9500-550/2200
3	100	G.E.	H	1	33000-2300
3	100	Whse.	SS	1	12075/10955-230/460
3	50	Al.Ch.	O.I.S.C.	1	22000-220
2	50	Wagner	HE	1	13200/11880-575/287
2	37½	Uptegraff	HD	1	2300-115/230

DIRECT CURRENT MOTORS

Qu	HP	Make	Type	RPM
1***	3000	Whse.	Encl.(Rev.)	600
1***	2400	Whse.	Encl.(Rev.)	600
4***	1500	Whse.	Encl.(Rev.)	600
4***	1200	Whse.	Encl.(Rev.)	600
4***	800	Whse.	Encl.(Rev.)	600
1	350	G.E.	CD-169	1180
1	325	Whse.	QM-460.6	450/900
1	200/250	El.Dy.	No. 32	400/128
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	300	Whse.		240/300
1	180	G.E.	MPC	600
2*	150	C.W.	83-H	890
1***	125	Whse.	SK-190	600
2	125	Whse.	SK-184	575/850
1	100/125	Rel.	1985-F	300/1200
2	100	Rel.	1050-T	400/1200
1	90/160	G.E.	MPC	625/1125
1*	50/75	Rel.	1985-F	300/1200
1	35	G.E.	RF-14	500/1500
1	35	G.E.	CD-125	400/1200
1	35	G.E.	CD-147	300/1200
1	35	Rel.	35P	250/1000
1	32½	Whse.	SK-150	400/1200
1*	30/75	Whse.	SK-151L	400/1200
1	30	Al.Ch.	E-145	400/1200
1	30	G.E.	CDM-105	875/1750
2	27½	El.Dy.	15S	450/1350
1	25	G.E.	RF-13	400/1600
1	25	Whse.	SK-140	400/1200
1	25	Whse.	SK-111L	250/1000
2	20	Al.Ch.	E-130	400/1200
3	20	G.E.	CD-123	300/1200

All above 230-VDC except where marked ***

*** Pedestal bearing mill design 525/600-VDC.

(Rev.) Designed for mill reversing service.

* T.E.F.C.

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GAS — DIESEL — ELECTRIC

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SUBJECT TO PRIOR DISPOSITION

Bucyrus-Erie 54-B Standard Shovel with 26 ft. boom, 18 ft. dipper handle, 2½ cu. yd. bucket. Powered by Buda Diesel. This machine has been completely overhauled, and is ready to go. Location, Woodbridge, N. J.

Price $49,000

Lima Type 1201 Loading Shovel, 28 ft. boom, 24 ft. dipper stick, 3½ cu. yd. dipper. Powered by Cummins Diesel. Location, Mountain Iron, Minnesota.

Price $37,500

111 M Marion Standard Shovel Attachment, 80 ft. boom, 22'9" Stick, 3¾ yd. Manganese Bucket. This item is brand new. Located in Johnstown, Pa. Immediate delivery at considerable less than replacement cost.

1—Bucyrus-Erie 54B Hi-Lift Shovel Front with 45' Boom, 25' Tubular Steel Handle and two c.y. Dipper. Location Johnstown, Pa.

High Shovel Front for Lima 1201 with 42 ft. boom, 22 ft. dipper stick and 2 cu. yd. bucket. Complete with laggings, etc. New in 1947. Available immediately.

We also have several Hi-front Shovel attachments for Lima Model 1201 machines.

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MINING — MILLING — BARGAINS

All sizes—turbine pumps, crushers, rolls, steel jigs, Eimco and Sullivan muckers, drifters, jackhammers, hoisters, electric motors, concentrating tables, filters, float machines, thickeners, Mancha trammers.

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1—Sullivan HL3 rocker shovel, completely reconditioned . . $1,250

1—International UD18 — 100 H.P. diesel power unit, excellent $1,500

2—Rogers jaw crushers, complete $1,250 each

1—Universal #4 Hammermill, capacity to 65 tons per hour, excellent $1,650

1—2 disc filter, rebuilt, perfect $1,500

2—Doerr thickeners . . . $395 each

1—Large trommel screen, 14' x 5' complete $750

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RAILS-TIES
TRACK ACCESSORIES

RELAYING RAIL
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CRUSHERS FOR SALE

One Kennedy Van Saun No. 17 Crusher and one No. 37½ without spider casting. These crushers with motors and feeders never used. For particulars write W. H. Loomis Talc. Corp., Gouverneur, N. Y.

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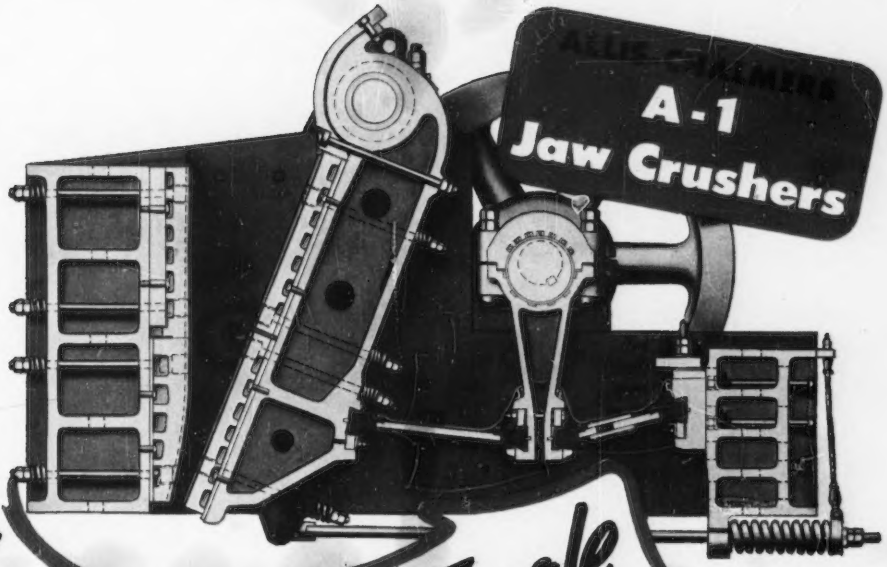
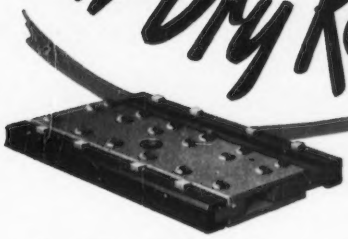


New Dry Rolling Toggle



✓ Outlasts Conventional Toggles
✓ Reduces Maintenance Costs

Dry rolling toggle was developed by Allis-Chalmers for A-1 jaw crushers ...can be installed on other jaw crushers now in use.

The Allis-Chalmers representative in your area will be glad to give you complete facts about A-1 jaw crushers. Allis-Chalmers, Milwaukee 1, Wisconsin.

NO LUBRICATION True rolling action of toggle ends and seats requires no lubrication. No oil lines or lubricant needed. No oil drip from toggles to pit below crusher. Increased safety and cleanliness!

ROLLING ACTION Replaces friction-producing sliding action. Toggle bearings are cold even after 16 hours of tough crushing!

LESS WEAR Rolling rather than sliding action between toggle ends and seats results in greatly reduced wear. Abrasive dust has little or no destructive effect.

LASTS LONGER Improved toggle is safety shear type. Only inexpensive rivets shear off when unbreakable materials enter the crushing chamber. No need to replace the whole toggle! Rivets can be replaced easily in the field.

A-1 and Pulverator are Allis-Chalmers trademarks A-3517

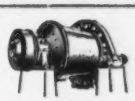
ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Pulverators

Vibrating Screens

Jaw Crushers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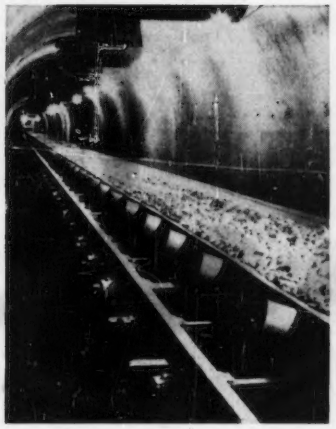
Gyratory Crushers

Kilns, Coolers, Dryers

For heavy-duty conveyors . . .

IT'S TIMKEN®...AND TIMKEN AND TIMKEN AGAIN!

In use since 1944 at the Ohio Sand & Gravel Company, Cincinnati, Ohio, this 634-foot Continental Gin Company belt conveyor handles 275 tons of gravel per hour. Timken bearings in the idlers assure long idler life, less friction, minimum maintenance.



Carrying limestone or flux from storage to distributing system, this reclamation conveyor uses Timken bearing equipped Rex Idlers, has a 36"-wide belt and handles 450 tons per hour. It's located at Kaiser Company, Inc., Iron & Steel Division.

This conveyor belt system, used to stack limestone at the Inland Limestone Company, Manistique, Michigan, has been in operation 21 years. It was built and installed by Stephens-Adamson Mfg. Co., and uses Timken bearing equipped idlers.

AND HERE ARE 6 BIG REASONS WHY:

1 THOROUGHLY PROVED. The Timken® bearing is the only tapered roller bearing proved by 15 years or more of service in heavy duty conveyor installations using the popular dead shaft construction.

2 EXTRA CAPACITY. Line contact between rollers and races gives Timken bearings high load capacity. And by using Timken bearings sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost *less* than the smaller sizes you'd normally use.

3 LONG-LIFE LUBRICATION. Not just lubricated for "life" but lubricated yearly or as conditions require to insure *long* life. Fresh lubricant ends gummy, sticky, jammed bearings.

4 LONGER ROLLER AND BELT LIFE. Less sliding and scuffing between idlers and belt.

5 FRICTION MINIMIZED. Timken bearings' true rolling motion and extremely smooth surface finish practically eliminate friction.

6 MAINTENANCE REDUCED. Long life and dependable performance of Timken tapered roller bearings cut maintenance to a minimum.

Remember "Timken" is not a bearing type. It is a trademark applying only to bearings made by The Timken Roller Bearing Company. Always insist on Timken bearings in the conveyors you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬯ AND THRUST →⬯← LOADS OR ANY COMBINATION →✳←